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THE AMERICAN GAS LIGHT JOURNAL

REDMAN & KENNY, N.Y.

PUBLISHING OFFICE No. 42 PINE STREET

DEVOTED TO THE INTERESTS OF ILLUMINATION, VENTILATION, WATER SUPPLY AND DISTRIBUTION, & GENERAL SCIENCE.

VOLUME XLIX.—No. 10. Whole No. 706. | NEW YORK, FRIDAY, NOVEMBER 16, 1888. | $3 PER ANNUM, IN ADVANCE.

A. M. CALLENDER & CO., Proprietors. C. E. SANDERSON, Manager.
JOS. R. THOMAS, C.E., Editor. T. J. CUNNINGHAM, Asst. Editor.

ENTERED AT THE POST OFFICE AT NEW YORK, N. Y. AS SECOND CLASS MATTER.

Remittances should be made either by post-office order, registered letter, or bank draft on New York, payable to the order of A. M. Callender & Co.

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BRIEFLY TOLD.

DEATH OF DR. JOSEPH SARGENT.—When, at an early hour of the morning of October 13, last, the hand of death softly, but none the less mercilessly, descended on the mortal frame of Dr. Joseph Sargent, of Worcester, Mass., a sterling, honored man paid the debt he owed to nature. In harmony with his serene though busy career came its peaceful termination. Although the Doctor had passed the line which marked the rounding out of the allotted period of three-score-and-ten, neverthe less his yet green and seemingly vigorous old age appeared a guarantee that many years of usefulness were still before him. That dread arrow of death—pneumonia—however, cut short these pleasurable anticipations, wherefore we are called, in common with the residents of his city, to mourn the loss of a reputable citizen, and a respected member of our craft.

Doctor Sargent was born in the town of Leicester (now in reality a suburb of Worcester), on December 31, 1815, and was the son of Col. Henry Sargent, a man of great prominence in the commercial, industrial and military life of Worcester county, Massachusetts. At the early age of 15 he entered Harvard College, graduating therefrom with pronounced honor in the class of '34. Having determined to follow the profession of a physician, for which course in life he was admirably endowed by nature in that he was the possessor of a sympathetic mind, a hearty manner, and keenly-swift perceptive faculties, his first step was to imbibe his primal knowledge of disease and its alleviation from Dr. Edward Flint, of Leicester, a man whose fame was great in the New England States, and who was, we believe, the grandfather of the late Dr. Austin Flint, of this city. He subsequently pursued his studies under the tuition of Dr. James Jackson, of Boston, and later on took a course of lectures in Philadelphia. In 1837 he received his degree of M. D. from Harvard University, and was at once appointed House Physician at the Massachusetts General Hospital. In 1838 he visited Europe for the purpose of perfecting his medical and surgical course by means of study and observation in the great hospitals of London and Paris. In the spring of 1840 he returned to the United States to settle down in the practice of his profession in the city of Worcester, which was to be the scene of his future life and labor. A review of the above shows that the youthful Doctor had had every advantage in putting together the foundation stones on which his fame as a physician was to rest, and this careful preliminary work explains the celebrity which he soon enjoyed as a healer of the sick in and about Central Massachusetts. An extensive and rapidly increasing practice, however, did not prevent the Doctor from engaging in many enterprises related to industrial pursuits. In 1845, on the formation of the State Mutual Life Assurance Company, he became a Director therein and its Medical Examiner, a post held by him up to his death. In 1850 he again visited Europe, remaining there but a few months, although that stay was sufficiently lengthy to cause him to appreciate the great and growing possibilities of gas as an illuminator, then fast becoming a huge factor in the local commerce of Great Britain. Full of this idea he returned to Worcester (Jan., 1851) and began to agitate the question of the formation of a local gas company. Others readily fell in with the Doctor's line of argument, and the Company was chartered in the same year. He served on its first Directory, and in 1866, on the resignation of its then President—Mr. Geo. T. Rice—was chosen its chief executive, which relation was only terminated by the fiat of death. The history of this Company bears out the story of his life. Careful, prudent and conservative, no step was taken that did not give promise of its falling on a safe path; nor did this calculation often go astray. Of course, the Doctor was surrounded by men who were efficient staffs, and much of the credit should be and is awarded them for their acumen and fidelity; but the full measure of credit for their assistance was never denied by their leader.

Of course, it is not expected nor is it necessary that we should here recount the connection of deceased with the many enterprises in which he was engaged. Suffice it to say that his name is encountered in various capacities with almost every important medical, financial and charitable trust in and around Worcester. Nor did he neglect to give his counsel and material assistance to those wells from which youth takes up the knowledge that is to fit it for the battle of life. He was a potent

factor in the Clark University, being one of its Trustees, an office that he dearly cherished. Deceased was a logical, terse and polished writer, although his fancy in literature leaned towards biography rather than to the formal presentation of facts and theories connected with the practice and development of his profession. Still his report to the American Antiquarian Society on the "Medical Department of the United States Army during the Rebellion" has been much sought after.

In 1841 Dr. Sargent was married to Miss Emily Whitney, of Cambridge, Mass., and their subsequent life was one of unbroken harmony. His widow, two daughters, and two sons survive to mourn the severance, while they cherish the recollection of the charming ties that bound them together in the net of affection and respect. The funeral services were held, at his late residence on Hammond street, on Monday, Oct. 15. In conclusion, we have only to say that deceased enjoyed the respect and esteem of those who by their closeness to him were best qualified to pass on his worth as a man and his reliability as a friend.

THE COST OF GAS ENGINES.—Some time ago we mentioned that American gas makers often referred to the fact that the price at which a good gas engine could be purchased in our market was seemingly too high. They argue, for instance, that a prospective customer—say one whose necessities call for the employment of motor power during but two or three hours of the day—will say, "Why, I could not think of making so great an investment," when informed of the first cost of the motor; and that ends the mater. In our building there is an engine of the Ericsson type (about one-horse power), that is employed solely for the purpose of filling a storage tank on the top floor—the Croton head in the southern district of the city is insufficient to elevate the water above the third floor, say a height of 38 feet. This pump is used only every other night, so that during 75 per cent. of the year it remains motionless. The owner of the building—we are requested not to state what sum of money has been invested in the placing of the motor—however, after the first shock given him by the presentation of the bill, complete, for motor, couplings, pipe, etc., and after the motor had been in operation for three months, freely asserted that he would not return to the old practice, even if the one that replaced it had cost twice as much as it really did. Here is where the impatient gas maker loses, either by his impatience, or his lack of perseverance, or his carelessness in respect to business-like methods. When the prospective intermittent day-user of power hints at the possibility of procuring a gas engine, and is inclined when informed of the cost thereof to drop the subject, why would it not be good policy to say to him: "We will put in for you an engine of the desired size for trial; if it does not suit you, or you are in any way displeased with it after a probationary period of three months or so, why, we will remove it. All that it will have cost you is the gas that it may have consumed." If the experience of the owner of the premises at 42 Pine street is to go for anything—and he is a hard-headed lawyer—many a sale of gas engines would be thus made. We are led to these remarks by a letter recently received, which takes exception, in a decidedly far from displeasing style, be it said, to the remark commonly made by engineers to the effect that gas engines are too dear; and we do not publish the letter because of a doubt whether or not such a proceeding would be agreeable to our correspondent. We may, however, without any show of bad faith, make use here of one or two remarks contained in it. In the first place, our informant, whose assertions are all guarded and based on absolute facts, says that gas engines of the Otto type are sold in this country at European rates, although the American engine is made out of American materials and by American workmen. We confess that this is a surprise to us. Further, during the years that have passed since the introduction of the Otto gas engine to our list of home manufactures was made, many improvements have been incorporated in it, and the improved engine, of greater power, and working with reduced back pressure, sells for no higher figure than did the original type. Again, the one-horse Otto engine of the vertical type can be purchased for $290; whereas the horizontal engine of equal power did cost $375. The laborer is worthy of his hire, and in our prior remark that gas men generally considered the price of gas engines in this country was too high, we did not wish to be considered as saying that the gas man could take refuge in that impression from any dilatoriness exhibited by him in assisting in their introduction. It must be remembered that if the gas engine maker reaps a profit on his wares, his profit is also made once for all; whereas the profit of the gas maker will likely be indefinitely continued. The latter may not make so much as the other for the moment, but his compensation is that the profit in the end will be vastly greater.

ONE of the most pleasing features of the outside happenings that attended the recent convention at Toronto, was the gallant way in which Miss Banks (a daughter of N. P. Banks, of Massachusetts, who by-the-way has just triumphantly routed his competitor for Congressional honors) was treated by a host of gas men, marshaled by big-hearted Fred. Davis, of Waltham, and his aid, the no less genial-souled Coffin, of Gloucester. Miss Banks, who is an actress giving promise of great ability, was on the bills of a local theatre during convention week, and the gentlemen in question, in conjunction with 78 other visiting gas men, visited the theatre in a body and subsequently presented her with a magnificent floral token. The sprightly Eastern lady was completely surprised at this portion of her Toronto experience, but speedily recovered during the formal reception, in which she showed herself to be the worthy daughter of a sterling Massachusetts patriot.

The New Sugg Lamp.

At the annual meeting of the shareholders in the Corporation of Wm. Sugg & Co., held Oct. 31, 1888, Mr. R. P. Spice made the following remarks:

Mr. Chairman, with your permission, I wish to say a few words concerning the new lamp which has been invented and perfected by Mr. Sugg. This lamp gives a light equal to 250 standard sperm candles, with a consumption of only 20 feet of 16-candle gas; which means a light equal to 12½ candles for each foot of gas consumed, and this is done without the aid of any reflecting medium. The character of the light produced is superior in color to that given by either the arc or glow electric lamps, resembling more nearly the light of day than that produced by electricity, which, with all its admitted or presumed advantages, is popularly felt to be too much like cold moonshine, ghostly, ghastly, and fitful as it is usually furnished; whilst that of the gas burner is absolutely steady, reliable, and genial.

As compared with the standard London gas burner, its economy may be fairly stated as being in the proportion of two to one; hence the practical effect is to reduce the cost of gas lighting to the extent of one-half, in any or all cases in which a powerful light is required in any building.

The London standard argand burner consumes from 5 to 6 feet of common air to effect economic combustion, and the product is carbonic acid; the new burner is fed with 10 feet of air for each foot of gas consumed, and, as the consumption of gas by this lamp is 20 feet, it follows that 200 feet of air is passed through it for every 20 feet of gas used.

In every 10 feet of air there is only about 2 feet of oxygen, the remaining 8 feet being nitrogen. The oxygen of the atmosphere is only in mechanical combination with the nitrogen, just as two different sized shots or marbles may be imagined to be in a bag.

Coming through the new lamp under a slight pressure as it approaches the flame, the oxygen, which has no affinity with the nitrogen, but has a strong affinity with the hydrogen and carbon of the gas, leaves the nitrogen and unites chemically with the principal constituents of the gas, which are carbon and hydrogen, producing light and forming carbonic acid.

By using 200 feet of common air in the combustion of 20 feet of coal gas, we have as the resulting effect the greatly desiderated oxyhydrogen light, without being driven, as of old, to the use of manufactured oxygen at the cost of about threepence per cubic foot.

As regards the power required to drive the 200 feet of air through the lamp to effect the maintenance of this economic result, it may be stated in popular terms not to exceed that which may be exerted without any appreciable effort, by the application of a human finger to give motion to a wheel 12 inches in diameter, fitted on an axle and free to revolve thereon.

This amount of mechanical power would suffice for maintaining four of these burners in continuous action at the same time, giving an aggregate illuminating power of 1,000 standard sperm candles, each one consuming 120 grains of sperm per hour.

An electric arc light of 1,000-candle power is said to require one-horse steam power to maintain it, and for incandescent or glow lamps, to give the same amount of light, steam power amounting to about that of three horses is the usually considered quantity to provide; therefore by this gas lamp, one human finger for motive power, may be put against the one-horse power for an arc electric light, or three-horse power for the incandescent light, all being of the same illuminating power.

But the most important result yet remains to be noticed, and that is the immense advantage of getting rid entirely of all the products of combustion, which are all driven off into the outer atmosphere, none remaining in the building within which the light may be produced; all the vitiated air from the burner, and all noxious fumes, being delivered by means of a small pipe into any conveniently situated flue, and ultimately discharged outside the building.

The Windsor Street Gas Works of the Birmingham Corporation.

By Norton H. Humphry's, Assoc. M. Inst. C. E.

As instancing the extensive demand for gas that exists in England, reference may be made to the large gas works that are gradually springing up in our more important towns. Until within a few years since, it was supposed that one must go to London to see a large gas plant; but now we find that Birmingham, Glasgow, Leeds, Nottingham and other towns can rank with the Metropolis in the matter of large retort houses, colossal gas holders, and such like. The gas works which forms the subject of the present article, as the reader will probably see, is entitled to a front place as regards productive capacity, apart from other characteristic features; and the writer is indebted for his information respecing them, to a personal inspection under the guidance of Mr. Chas. Hunt, M. Inst. C. E., and also to a handsoms folio volume comprising a revised reprint of a series of descriptive articles, completely illustrated to scale, that have appeared from time to time in the volumes of the *Journal of Gas Lighting*—a book, by the way, which all interested in the constructing of gas works would do well to possess.

The site occupied by these new gas works is about 16 acres in extent, adjoining a comparatively small works of old-fashioned design, which has since been partly dismantled. It is almost square in shape, bounded on one side by a small railway, on another by a canal, on a third by a road leading into a main thoroughfare of the town. But against these advantages must be set an uncertain subsoil, and considerable variation in level, the greatest difference being 30 feet. As regards the value of the soil, it is stated in the book that "the works are located almost upon the edge of a kind of basin, or wide and deep valley formed in the sandstone; filled up with drift deposit consisting of fine sand, stiff and sandy loam, and fine drift coal. * * Water is abundant, occurring at about 11 feet below the surface at the lowest point, while the loamy nature of the soil makes effectual drainage a matter of almost absolute impossibility."

In some parts, a good foundation on sand and loam was obtained. But very considerable difficulty arose, especially in connection with the holder tanks, on account of the presence of a soft, unsatisfactory stratum full of water. In preparing a description of these tanks, the *Journal of Gas Lighting* says (see Vol. 47, p. 61): "The following narrative of difficulties and eventual triumph is not to be paralleled in the records of gas engineering. It is only justice, therefore, to the perseverance and foresight of the engineer, as well as to the enterprise of the contractors, and the devotion of the executive of all ranks, that this account of as arduous a piece of work as was ever carried to a successful termination should be prefaced by an expression of warmest congratulation upon its triumphant conclusion." The site was acquired in 1878, and Mr. Chas. Hunt was instructed to prepare plans for a works to produce gas on the most economical principles, with a proper attention to the rapidly extending business, and other circumstances connected with the gas undertaking. This was done, the works being entirely designed and carried out under the superintendence of Mr. Hunt, and they are now in regular going order.

The objects kept in view, in designing the works, have been concentration of the various processes, with a due regard for sectional division. The works are not crowded at any part, yet when fully completed the productive capacity will be about 9 million cubic feet per diem, and in all other respects the plant will be capable of dealing with 13½ million cubic feet per diem. All connecting mains, which are 36 inches in diameter, are laid in duplicate. The advantage of this is obvious, as enabling further extension to plant to be made and connected up, with the least amount of disturbance or interference with the daily routine. In respect to provision for future extensions, the existing buildings provide for doubling the exhauster, boiler, and meter power, and practically that of condensing also. Foundations were also prepared for additional purifiers. The nature of the ground, which required to be filled up in many places, rendered it advisable to put in all foundations at once, so as to avoid the necessity for future disturbance. Other important objects, considered in arranging the works, were economy in the transport, delivery, and storage of coal, facility for working the retorts by machinery, delivery of coke to the purchasers' conveyances, handling of purifying materials, etc.

On entering the gates the visitor's attention is first attracted by the twin gasholders, the framework of which towers to a height of 151 feet from the tank curb. They are so close together that a portion of the framework is common to both. Each holder comprises three lifts, respectively 230 feet, 233 feet and 236 feet in diameter by 50 feet deep, and is capable of containing about 6½ millions cubic feet of gas. The next feature in point of prominence is the retort house, a rectangular building, 490 feet long by 210 feet wide. In the foreground are the viaducts which form a communication between the railway above mentioned, the retort house, purifying sheds and coke yard. Commencing on the right hand next to the railway, which is on a level with the highest part of the ground, we have the gasholders, the curb of the tanks being level with the railway. Seven feet below this level a terrace has been formed, extending the whole length of the works, on which the purifying houses, condensers, washers and subsidiary buildings are placed. Strong walls are provided as a support to the tanks on the side facing the purifiers. On the left hand of this terrace there is another retaining wall, 9 feet in height, then a wide space at present used as a coke yard, and on the extreme left the retort house. This building, and also the purifying sheds, etc., are arranged longitudinally so that one end of each faces towards the entrance. The railway is supported on an embankment where necessary, as far as the edge of the terrace, and for the remainder of the distance on cast iron columns carrying wrought iron girders. In addition to the line running into the retort house, there is a branch leading to the purifier house and coke yard, and another to the stores. The exhauster house, boiler house, workshops, hydraulic pump house, meter shed, etc., are conveniently arranged on a low level site in the immediate foreground, and therefore within easy distance of the offices and entrance. The whole of the works give a pleasing sense of substantiality, rigidity and strength. There is an utter absence of anything in the way of the gingerbread type. The buildings are all firm, free from cracks or any signs of subsidence, and might be supposed to be founded upon rock instead of the very unsubstantial soil above described. The iron work is simple, neat and strong, with a liberal but not excessive introduction of ornament thoroughly braced and held together in every part.

The retort house roof is supported by Warren girders extending right across the whole width, about 30 feet apart, each bay being covered by a separate transverse ridged roof, hipped at both ends. The width is divided into five spans; two principal ones of 70 feet each, represented by the spaces occupied by the retort beds and adjacent floors; two of 13½ feet each—one on either side of the building—forming coal stores; and a central span of 43 feet, comprising two inner coal stores, and an arm of the canal, 16 feet wide, in the center. Branches from the railway enter each of the coal stores, and the canal extends nearly the whole length, so the retort house possesses the advantage not only of direct rail, but also of direct water communication. It will be seen that there are two rows of double settings, each extending the whole length of the retort house, each side having its separate working floor and coal store. Each row comprises three sections of 14 beds each, and each bed is capable of containing 9 large double retorts. So the producing plant comprises a total of 84 beds of nines, or 756 through retorts, equivalent to 1,512 single retorts in all. The house is built on the stage principle, having a raised floor of cast iron 10 feet above the ground; and the lines of rail in the coal stores are 10 feet above this, or 20 feet above ground level. The arrangements are extremely convenient for any system of working the retorts by machinery, and at present Ross's steam stoker is used exclusively for discharging the coke from the retorts.

Several experiments in the methods of heating retorts by gaseous fuel have been tried, and, by combining the use of fuel direct from the retorts with the regenerator system, the fuel account has already been reduced to less than 10 pounds of coke per 100 pounds of coal carbonized, and it is expected that continued experience will result in further economy.

The arrangements on the top of the benches present several special features. In the first place the hydraulics, though placed in the usual position, are independent of the brickwork, being supported upon wrought iron joists, fastened to the tops of the buckstaves in such a manner that they also serve as ties. Tar overflows leading into a tar main, also supported on the joists, with weir valves for regulating the depth of seal, are also provided. The gas is taken off from the tops of the hydraulics, and, instead of passing direct to the final main, is first caused to travel through towers about 20 feet high and 4 feet diameter, fitted with trays after the manner of a Coffey still. A considerable quantity of heavy tar is separated out by the apparatus, and flows back to the hydraulic, thus fulfilling the conditions generally accepted, that the heavy tar should be separated from the gas before it is cooled. These towers are arranged in a row down the centre on the top of the stacks, one tower being provided for every two beds.

The towers are of the ordinary vertical kind, covered with tanks for water, liquor, tar, etc. These tanks are about 13 feet wide by 5 feet deep, and form the four sides of a quadrangle, which is covered with a light iron roof. They are supported on columns, and ornamental arches of cast iron at the top, with parapets of the same material at the base, com-

bine to form a structure of very pleasing appearance. Three sets of condensers, each of the nominal capacity of 2½ millions cubic feet, have been erected, and there is accommodation for two more. Each set is formed of six series of cast iron pipe, so that the stream of gas is divided into six branches. The pipes are 9 inches diameter, and the total length in each set is 5,130 cubic feet, representing an area of 5.6 square feet of exposed surface per 1,000 cubic feet of gas per diem, which has been found ample. Each set is divided by valves into three sections, so that one, two, or the whole can be worked at will, thus enabling the condensing capacity to be regulated according to make of gas, or climatic conditions. The liquid products are allowed to pass into separating tanks, from which the tar passes off to the storage tank, and the liquor to two Livesey washers, which are thus continually supplied without recourse to pumping. Each washer is of the nominal capacity of 4 million cubic feet per day, and the gas passes through them on leaving the condensers. The boiler house, exhauster house, and pump room are comprised in one block. The exhauster house is of elegant design, at present filled with three exhausters, each with horizontal driving engine, representing a total capacity of about 10 million cubic feet per day. The pumping plant includes a Tangye's "special" pump, purposely made for dealing with tar.

After passing through a "standard" washer-scrubber the gas is conveyed to the purifier shed. The design of this building matches the condenser cover, and the shed is 103 feet wide by 320 feet long, affording accommodation for 12 boxes, arranged in groups of threes, each box being 40 feet by 32 feet. They are placed on the ground floor, and the oxide revivifying floor is above them. Two such sets form a complete system, the gas being passed through 4 oxide purifiers, and two lime. Hydraulic power is used for lifting the covers, and for removing the material, and there is also a hydraulic lift for raising wagons to the level of the revivifying floor. The station meters are situated in open sheds, of design similar to the above. Steam coils are laid at the base of each meter to obviate the effect of frost.

It will be observed that the use of iron as a structural material is largely adopted in these works. Two-thirds of brick, respectively known as "Oldbury brown" and Staffordshire blue, are used in the building. An experimental gas plant with laboratory, etc., has been erected on the works.

[Communicated Article.]

Self-Sealing Retort Lids vs. Luted Lids.

Some individuals, probably belonging to the mis-mated or unmated class of society, have lately raised the question, through the medium of the daily press, "Is Marriage a Failure?" This question, it was thought, had been settled in the negative, ages ago, by the great majority who have been happily mated.

The matter of self-sealing lids, and their superiority over luted lids, it was thought also belonged to ancient history; but it appears that a small minority, among whom may be mentioned Mr. Jas. Somerville and his Hartford pupil, find the difficulties attending their use *insurmountable.*

In Mr. Somerville's paper, read at the late convention at Toronto, entitled "Daily Experience and Observations of a Gas Manager," he thus arraigns the self-sealing lid, appointing himself both judge and jury:

"These self-sealing lids are so only in name. They do fairly well for the first year or so; * * * beyond that period they are unable to withstand the wear and tear of the retort house. The parts begin to wear out, perfect contact cannot be obtained, their efficiency is ended and we have to fall back to the old lute. I confess I have given the subject of self-sealing lids much thought, but the difficulties appear to be insurmountable." He then sums up, the duties expected of self-sealing lids, as follows:

"They must be able to stand all changes of extreme temperature. Their efficiency must not be impaired by the wear and tear of the parts, and they must be able to make a perfectly air-tight joint every time they are shut, notwithstanding that they have to be handled by men who believe only in the existence of muscle."

This wholesale condemnation of such an old and useful friend as the self-sealing retort lid will be rather a surprise to the great majority, who having used them for years, would not return to luted lids on any account.

Saying nothing of the great saving of money by the use of self-sealing lids, the use of luted lids is attended by an abundance of dirt, and extra room is required for mixing luting and storage of material.

The removal of the lids from the mouthpiece is a very hot and disagreeable work, causing the workman to slam them down without care or caution.

It is probable that the minority who have found their use so full of difficulty, have expected too much of them, without giving them proper care or attention, expecting perhaps that the lids would take care of themselves, forgetting that even *luted* lids require some attention.

The mouth of a hot retort, with its constant subjection to use of the roughest kind, and its drippings of tar and pitch, is not the place for fine workmanship or mechanism of any kind. The opening, latching and tightening arrangements must be of the simplest kind. In fine, a perfect self-sealing lid should fulfil the following requirements: Mouth-piece and lid should be made for each other. The lid should be cup-shaped, heavy, and stiffened with ribs on the inner side. The hinges should be as wide apart as possible, to prevent sagging. The number of bearings on the lid to receive the pressure should correspond with the size of the lid. Oval or D-shaped lids should have two or more bearings; circular lids, except of extraordinary size, need have but one bearing. The different parts of the hinges, fastenings, etc., should be kept in duplicate, and should be interchangeable. The wearing parts should be capable of adjustment by means of washers, or some other simple device.

As there are many varieties of self-sealing lids, each having advocates, it is not the province of this paper to enter into any detailed description of them.

The majority of those that have been longest in use, have a lid with a thin cutting edge bearing against the planed surface of the mouthpiece, and having different devices for pressing and securing the planed surfaces together.

Before closing the lid any small lumps of pitch can be scraped off of the face of mouthpiece with a shovel.

Lids of the above style are also made having a fastening device giving a scraping motion to the lid over the face of mouthpiece just before tightening, thus cleaning the surface at the moment of securing the lid. Another style of lid has a wedge-shaped edge, fitting into a V-shaped cavity on the mouthpiece. Still another has a groove in the lid fitted with lead, which presses against a thin edge on the mouthpiece. Others differ only in the manner of fastening, the lid being pressed into place either by a screw or lever.

No greater contrast can be imagined than that between self-sealing and luted lids. In the one case we have neatness and despatch, in the other much dirt made and time consumed, with extra labor added. With the self-sealing lid the movement of a lever or the turn of a screw loosens the lid, and it is thrown open in a second; by reversing the motions it is as quickly closed.

With the luted lids the workman, with tarry leather coverings for his hands, lifts off the hot and dirty lids, throwing them on the barrow and removes them to, perhaps, a distant part of the retort house, returning with a fresh set of luted lids which are put in place against the outpouring volume of gas.

It is possible that there are many small works where the introduction of self-sealing retort lids would not make any great difference in the amount of labor; there are also works that are gradually introducing them as the old mouthpieces and lids wear out. To these, of course, the contents of this paper can have but little interest, but it must strike the majority who have for years used the self-sealing lids as very strange that at this late day there should be any question as to their superiority, or any insurmountable difficulties attending their use.

As marriage may be a failure to those who, expecting perfection in their mates, find, when too late, that none are perfect, so also the gas manager who expects that self-sealing lids will be perfect, and remain so without proper attention, is expecting too much, and will find a failure somewhere—either in himself, or in the lids, or in the combination of the two.

W. M.

The Adaptability of Gas Engines for Driving Dynamos.

Practical Electricity, in its October issue, in reviewing this subject, speaks as follows:

While our American gas companies are just beginning to appreciate the advantages which they possess in the gas engine, enabling them to engage in electric lighting and power with much better prospects for financial success than many other corporations, the European gas companies have long since profited by these facilities to an extent which is but little known on this side of the water.

Our attention has been recently called to an interesting installation in the city of Prague, Bohemia, in which three gas engines, of the Otto type, of 75-horse power each, are employed to operate about 200 arc

lamps. The plant is located on an island in the river Moldau, and lights up the park which is also situated upon the same island. Still another interesting electric installation, using gas engines, is that of the Continental Gas Company of Dessau, which represents over three hundred horse-power and nearly two thousand incandescent lamps, used to light up the castle and the opera house of that city.

The foreign gas companies have not stopped at adopting gas power for their own use, but, having set the example to their consumers, have made to the latter special prices for gas, as an inducement for them to use gas power on a larger scale. They, that is to say, the gas companies, have not materially lost by the advent of the electric light, and for the simple reason that the use of gas power for isolated electric lighting plants is surprisingly large as compared with what has come under our notice in our own market. We observe in the list of users of gas engines published by the foreign builders, at least a dozen railway stations of importance which gas companies have retained as consumers for purposes of power, fully as many public buildings, such as libraries, banks, municipal offices, etc., and no end of private residences, among these that of Baron Rothschild, of Vienna, of Madam Adelina Patti, of Swanzea, Isle of Wight, of the Earl of Durham, of the Marquis of Salisbury, of the Duchess of Montrose, and of a long line of business firms; all showing that gas power is admirably adapted for and is being used for electric lighting.

The gas journals of this country, while agitating in recent years the fuel gas question, have thus far neglected to even hint at the fact that, so far as power is concerned, the gas engine has been simply waiting for special rates to be made to consumers during the day period, to solve the question. European gas companies have taken the lead in this direction, and by so doing have avoided the loss of business that many American companies have sustained by the growth of the electric light. In our large cities, such as Boston, New York, Baltimore, and so on, the slow motion, which is proverbial with large bodies, has caused the gas companies to lose business, which might otherwise have fallen to them, when the more enterprising electric companies started in to sell current for power at rates from thirty to forty per cent. less than those charged for lighting, in order to reduce the day expense. The gas companies in smaller towns, which are known as possessing more pluck and enterprise, have in many instances, begun to make up for time lost by not only adopting gas power themselves but allowing special rates to consumers of gas for power purposes. The smaller companies have not of course the rich field offered by our larger cities for the sale of gas for industrial purposes; but results which have been obtained in towns like Spencer, Mass., Raleigh, N. C., and Birmingham, Conn., where gas engines are largely in use, serve to illustrate what may be accomplished in more densely populated localities.

The sooner our gas companies take cognizance of these facts, the less cause will they have for complaints about dull business. The electric light has come to stay; thousands of dynamos will yet be built and sold, and we all know that it takes power to run them. The gas companies having the means of making cheap fuel, only require gas engines to put the business of electric light and power on a basis which shall prove as profitable to the producer as it ought to be economical for the consumer.

Injury to Coal by Spontaneous Ignition.

An English writer, in commenting on this subject, says that the questions pertaining to spontaneous ignition of coal have received the most extensive treatment from the various boards of investigation which have considered the subject. A recent American fire due to this cause, brings to light a new feature in regard to the subject. The facts in the case were that about five thousand tons of semi-bituminous coal, which were kept in two brick houses, ignited spontaneously in the early autumn, about the middle of September, the fire being discovered in the two houses within a couple of days of each other. From the indications on the top of the pile, furnished by the smoke curling in various places, it was apparent that the fire had extended throughout the whole mass; and the deposition of sulphur on the surface of the pile, as it condensed from the volatile matter rising from the interior of the pile, presented the appearance of a yellow dew. Of the injury to the building by the heating of heavy brick walls to dull redness, and the burning of all timber in contact with the coal, we have nothing to do; but the method adopted by the underwriters in the settlement of the loss was certainly outside of the usual course taken in such matters. This is, we understand, either to settle the loss on the basis of a lump sum, which one party tries to increase and the other to diminish, until, in the spirit of exhaustion rather than compromise, they settle on an average; and the other plan is to pay for the coal, and then sell it to small consumers by forcing the consumption by means of ruinously low prices, which do not reward the seller, and also interfere injuriously with the retail business in the vicinity. The method used in this instance was to take a sample of the coal from a portion which was uninjured, and subject it to chemical analysis, which gave:

Carbon	76.50
Hydrogen	3.98
Mineral matter	12.13
Sulphur combined with iron	.79
" inorganic compounds	.69

The calorific value of a pound of this coal as computed from the above, equals 13,594 thermal units. Other samples were obtained from the average of the pile when about half of the coal had been removed to a yard, leaving an oblique plane, which cut through approximately the center of the mass. These samples were collected from regular points over the slope, and taken to a clean pavement, where they were crushed and thoroughly mixed over to obtain a smaller sample for the purpose of analysis, which should represent the average composition of the coal throughout the whole slope. This analysis gave:

Carbon	74.13
Hydrogen	3.95
Mineral matter	13.18

The caloric value of this sample of coal amounted to 13,230 thermal units, or 2.68 per cent. as the depreciation of the value of the coal by heating, and it was upon this basis that the loss upon the coal itself was reached. A sample of partially coked coal, which represented an average sample of the coal actually injured by heat so as to make a noticeable change in its appearance, showed upon analysis:

Carbon	65.77
Hydrogen	1.36
Mineral matter	26.13
Sulphur total	.82

The calorific value of the coal amounted to 10,409 thermal units, or 22.7 per cent. less than that of the uninjured coal. The cause of the heating was undoubtedly due to the presence of sulphur in its combination with iron, forming iron pyrites. A defect in the consideration of the liability of various forms of bituminous coal to spontaneous ignition, has been due to considering the total amount of sulphur as the measure of hazard, an assumption which contains two errors sufficient in themselves to render that process of forming an opinion entirely unreliable, because the sulphur liable to produce heat by chemical changes under normal conditions is the sulphur in combination with the iron, forming iron pyrites. This disintegrates under the most ordinary conditions, while the sulphur in organic compounds is not liable to such changes. Secondly, a measure of this liability is not shown by an ordinary chemical analysis, which represents a sample selected by averaging up a large number of specimens, but the danger is due to the greatest concentration of iron pyrites, and not to its average presence in the whole mass.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

THE proprietors of the Jackson (Mich.) National Gas Light and Fuel Company are supplying a non-carburetted water gas for fuel purposes in that city, at the rate of 30 cents per 1,000 cubic feet. One or more accidents have been reported which are traceable to the non-odorous nature of the product distributed, and it is likely the authorities will require the Company to alter the conditions of supply in so far as these relate to the defect noted.

DURING the past season 150 lamp posts have been placed in position by the Montreal Gas Company. It might also be noted that the local authorities now insist that the Company shall, where it is required to extend the lamp service to districts hitherto unlighted, take the posts from the districts illuminated by electricity, instead of being supplied with new ones.

THE "small boy" in Indianapolis has discovered a new method of diverting himself. The consumer's services on the natural gas lines are fitted usually with a shut-off box running up close to the curb line, and the gamins have acquired the habit of raising the box lid and dropping a lighted match into the well. Sometimes a slight explosion occurs, whereat the gamin rejoices. One of these days some small boy will likely be turned into an angel because of the propensity above noted; but in the meantime the police, at the instance of the President of the Consumers Gas Trust Company, have been instructed to keep an eye on the boxes and the boys.

THE United Gas Improvement Company is now quartered in the Drexel Building, Chestnut and Fifth streets, Philadelphia, Pa. The hegira occurred on the 1st inst.

WE are in receipt of the following courteous note from Mr. W. B. Sellers, Secretary of the Covington (Ky.) Gas Light Company, dated

November 5: "After serving more than 24 years as Superintendent of our works, Mr. Richard Salter, on November 1st, tendered his resignation. For the past two years the health of Mr. S. has been gradually failing, and his physician ordered him to give up business entirely. Mr. S. has been a faithful servant, and the Company regrets that the state of his health is such as to compel his relinquishing the charge of the works Mr. James Salter succeeds his father as Superintendent." To the regrets of the Company we must add our own; for the retiring Superintendent had the faculty of making friends and keeping them. However, Mr. S. certainly has earned the right in his declining years to enjoy the luxury of ease; and it is our earnest hope that a period of rest will restore him to that state of health wherein he may reap to the full the comforts that should surround those who have been faithful to their trust. We also extend our congratulations to Mr. Jas. Salter that he has been deemed worthy to carry on the work so faithfully borne by his father.

LANSINGBURG, N. Y., is divided on the question of introducing a mixed system of public electric lighting, and the question is to be settled by a special election to be participated in by the taxpayers. The proposition is to enter into a contract with the Union Electric Light and Power Company for the supply of 30 arc and 160 incandescent lights, at a total annual cost of $7,500 per annum; the contract to run for 5 years.

LAST April we mentioned the fact that the Mayor (W. G. Whipple) of Little Rock, Ark., had successfully carried through his scheme of causing the city to invest in an electric lighting plant, at a cost of about $27,000 for the installation, and with the understanding that the annual expense of maintenance would not exceed $6,000. It was also understood that this plant (to supply current to 4 towers and 90 separate arcs) would render a complete lighting complement to the city, that no gas posts would thereafter be required, and so on. The service was begun, if memory serves aright, about the first of August, and it is now in order to see how far Mayor Whipple's action has been justified in practice. Our information is to the effect that the lighting service is totally inadequate, and that the cost of maintenance, if the rate of same up to the 1st inst. is to be taken as the rate for the balance of the year, will not fall far short of 33 per cent. ($2,000) in excess of the Mayor's promised expenditure. The figures prove themselves; and as to the inadequacy of the service, we may mention that an ordinance is now before the Council which proposes to authorize the expenditure of an additional $1,500 for the purchase of the necessary materials (mast arms, poles, wires, lamps, etc.) for 10 more arc lights.

FRANK HAMMOND, who succeeded to the Superintendency of the Middleboro (Mass.) gas works, on the death of Mr. Wilbur, has resigned that berth to accept a similar position at Farmington, N. H.

THE Kenosha Gas, Electric Light and Fuel Company is the title under which the old Kenosha (Wis.) Gas Light Company is to operate hereafter. The capital is placed at $50,000, and Messrs. J. H. and E. M. Kimball and Edgar G. Hazelton are still the prime movers of the enterprise.

THE Directors of the Belfast (Maine) Gas Light Company have at last taken the bull by the horns and put the price of gas at $2.50 per thousand cubic feet, a concession of $1 per thousand. The new rate may on its face seem a high one to those unacquainted with the locality and the conditions, but a better understanding of the pluck of the Company's proprietors will be had when it is said that the Belfast schedule would be about equal to a charge of $1.75 per thousand in any of the Hudson river towns of New York State. The Belfast folks, however, now that the advance step has been taken, do not propose to stop at their present halting point; for in the notice of the reduction they say that as soon as the output reaches the maximum capacity of the plant another concession shall be made.

THE public lighting at New Haven is accomplished at present by means of 811 gas and 516 naphtha lamps, and 139 arc lights of the 2000-candle power variety. The lights remain in action each night and all night. The prices paid per year are appended: Gas lamps, $28; naphtha, $20; arcs, $187.50. The appropriations for the service of last year were thus apportioned: Electric lights, $25,620; gas, $22,400; naphtha, 10,000. Other expenses brought the total payments to $62,075. These figures may prove of interest from the fact that all the New Haven contracts (which usually are made to cover a period of 3 years) for public lighting expire by limitation on Dec. 31.

THE Board of Directors of the Newark (N. J.) Gas Light Company, at a meeting held on Sept. 21, unanimously decided to reduce the selling rate, the same to take effect on Jan. 1. It was at the time determined to withhold publication of the notice until the 1st inst., so as to enable the Directors of the other Newark Company (the Citizens) to make a concurrent announcement. The latter having agreed to the proposition, the following schedule will go in force on New Year's Day: The gross rate is placed at $1.60 per thousand, with 10 cents off on all bills settled within 5 days from presentation, or a net rate of $1.50. The prevailing charge is $2 per thousand, with 20 cents off for prompt pay. President Vanderpool has kept his word; in fact he always does.

Mr. Barnabas E. Cutter, formerly Superintendent of the Saco and Biddeford (Me.) Gas Light Company, died (at his home in Salmon Falls) on the morning of Oct. 31. He was born in Newburyport, Mass., Feb. 11, 1813; was a man of sterling integrity and correct habits, and had for years been a prominent and respected figure in the commercial and social life of Biddeford.

PRESIDENT MCILHENNY, of the Washington (D. C.) Gas Light Company, early this month notified the authorities that, having completed the holder and tank located in Square 1025 of the city, he wished permission to be allowed to fill the tank (153 ft in diameter by 35 ft. in depth) with water from the Potomac river. The Potomac's liquid must be of wonderful value, for Capt. Lusk, to whom the application was referred, recommended that the permission be not accorded until the Company agreed to measure the water used by passing the same through a meter.

THE Silver Light Gas Company has been organized at Kittery, Me., for the purpose of "manufacturing gas by a chemical process for light and heat." The Company is capitalized in $600,000, and its officers are: President, F. E. Orcutt, Melrose, Mass.; Treasurer, Alvin A. Walker, Boston, Mass. This is probably a Company after the stamp of the one which two or three years ago urged the householders and storekeepers of certain sections of the West to purchase an apparatus from which the individual could supply himself with a 30-odd candle gas made from clamshells, iron-filings, and so on.

THE Directors of the Municipal Gas Company (Albany, N. Y.) have declared a 3 per cent. dividend payable from 1st inst.

AT the annual meeting of the Consumers Gas Company, Toronto, Canada, the old board of officers was re-elected; which means that the proprietors are perfectly satisfied with the way in which Messrs. Austin, Smith, and Pearson conduct their business. Still, how could they act differently?

THE indefinite suspension of the Berkshire Woollen Company's mill at Great Barrington, Mass., caused much uneasiness to the people of Great Barrington, who feared that, as the Company manufactured and supplied all the gas sold to the town and to the citizens, the Company's creditors would insist on the complete shutting down of the works. It seems, however, that an arrangement was made whereby the gas works portion of the enterprise was allowed to go ahead. Although the matter was satisfactorily adjusted, the instance affords, nevertheless, a seemingly convincing reason why Great Barrington should insist on a change in the policy hitherto pursued in respect to her gas supply.

THE residents of that portion of Atlanta, Ga., known as "Jackson Hill" were recently treated to an unpleasant experience. The authorities are engaged in constructing a sewer through Wheat street, through which runs the gas main on which "Jackson Hill" depends for light. The sewer cut is a deep one, and the contractors were negligent. At any rate, late one afternoon, while a heavy rain storm was in progress, the banks of the sewer trench on Wheat street caved in, and the gas main was badly fractured in several places—about 200 feet of the trench was open. Result, largely increased demand for coal oil and candles in the vicinity of Jackson Hill for perhaps one and one-half days. Further result; the creation of an idea in the minds of many Hillites that gas is a pretty good article for general use after all.

THE Waterhouse Electric and Manufacturing Company, of Hartford, Conn., has been awarded three medals by the Judges at the Cincinnati Industrial Exhibition. Of these one is a gold medal; the others are silver. This is the second gold medal received by the Company during the current year.

A HINT FROM ATCHISON, KANSAS.—Mr. R. W. Kelly, Asst. Supt. of the Atchison Gas, Electric Light and Power Company, under date of Oct. 30, forwards the following very interesting letter: "To the Editor AMERICAN GAS LIGHT JOURNAL:—From time to time I see in your es-

teemed JOURNAL bits of information from those of our fraternity who, being engaged in broad fields, are possessed of extensive experience. These hints I appreciate very much, and it may not seem presumptuous for one more circumscribed to contribute his mite, since all men should help their fellows according to their opportunity. Therefore, hoping to help some fellow-craftsman whose position, like my own, perhaps—and rightfully, too—depends on his successful management, I send you the following, under the heading, 'How to Repair a Leak in a Holder Pit Without Drawing the Water Out.' Our pit is 62 ft. diameter by 20 ft. deep; the wall is of brick, 2 ft. in thickness. A perpendicular crack developed in the wall, and to unite the broken bond thereof and successfully stop the leak without drawing off the water, I took down the wall from the outside, in the shape of the letter V, to the top of the water line. At this point I left a 4-inch wall, which thickness was enough to hold the water while the rest of the wall was being rebuilt. The crack in the 4 inch wall, after the other is taken down, should be caulked with marline or other suitable material, to prevent the water from oozing through and bothering while the wall is being relaid. Thus we have our wall as good as new again, without wasting the water or being without the use of our holder." Letters like this carry their value permanently, and we think that Mr. Kelly must be a successful manager.

SUPT. LEACH has been authorized by his Directors to again place the Taunton Gas Light Company before the people of that busy Massachusetts hive as a candidate for their suffrages; and on a low tariff platform, too! Strange to say, despite the objection of the East to anything savoring of low tariff, we venture the prediction that the Taunton Gas Light Company will receive a unanimous vote in respect of its latest candidacy. In any event the Taunton Company's Directors, on Saturday, Nov. 3, decided to reduce the gas rate to $1.50 per thousand cubic feet to general consumers, while those whose quarterly bills are made out at the rate of 125,000 cubic feet per quarter—and Taunton has a number of such consumers—are to be charged $1.40 per thousand. In 1886–7 the ordinary rate was $1.65, with a special rate of $1.45 in the case of those who used a quarterly quantity equal to that mentioned above. What's the matter with Taunton? Oh, Taunton's——!

AT a recent meeting of the Cohoes (N. Y.) Common Council a communication was received from the Cohoes Electric Company asking that the contract for public electric lighting might be terminated at the end of 2½ years—the contract was originally made for 3 years. The permission was granted.

UNDER its contract with the authorities the Charleston (S. C.) Gas and Electric Light Company is to furnish 14 arc lights, to be paid for at the rate of $144 each per annum. For every 24 hours after the 6th inst. on which the lamps remain unlighted the Company agrees to forfeit $20. The Charleston Gas Light Company performs by far the greater bulk of the public lighting.

WE understand that the City Council of Dallas, Texas, has awarded a contract under which 50 arc lamps (2,000 candle power, to remain in duty each and all night) are to be maintained for 3 years. Each light is to cost $83.95 per annum, and the city has the right to increase the number at any time on short notice.

A BOSTON correspondent sends the following: "The sale of the Newton Electric Light Company's plant and buildings to the Newton and Watertown Gas Light Company has aroused much interest. The electric company was incorporated about two years ago, with a capital of $50,000, the officers comprising the following: President, H. B. Parker; Secretary, H. G. Pratt, and six Directors. The Company received its first contract from the city to furnish 79 arc lights of 1,200-candle power, to burn until 12 o'clock of 20 nights in each month. When time approached to make a new contract which was to embrace the whole street lighting of the city, the Company offered to perform the work for $2,700 per annum. The Board of Aldermen voted to so award the contract, but owing to the non-concurrence of the Council, the matter has been delayed until the present time, pending the action of the Gas Commissioners, to whom the Gas Company had applied for the right to operate an electric plant—the Gas Company, in the meantime, proposed to perform the service for $2,500 per annum, provided the Commissioners gave favorable answer to its application. Delays are dangerous, and especially so to corporations whose income is not of the richest sort, hence the proprietors of the original electric plant, becoming discouraged, opened negotiations—I believe last July the proposition was first broached—with the Gas Company. *Festina lente* is also to be recorded in this dickering; but, to borrow a phrase which seems to be a favorite with the JOURNAL, as all things come to those who wait, the Newton Gas Company seems to have hastened slowly, but nevertheless surely. Some estimators (no one really knows what price was paid save those who are interested in the transfer) assert that the value of the old Electric Light Company's plant and buildings was in the neighborhood of $95,000, and that the Gas Company paid about $125,000 therefor in the settlement. All of which, as reporting committees are wont to exclaim, is respectfully submitted; but the tale is hard to swallow, and even if it could be swallowed I am quite sure that it never could be assimilated. No; the simple truth is that the Newton and Watertown Gas Company is controlled by men whose business practice is to give 100 cents' worth of value for each dollar taken in trade, and they are also given to the practice of expecting 100 cents' of value in the dollars's worth of goods they purchase. Permit me to close with the remark that they do not differ therein very greatly from the general run of those who succeed in business.—OBSERVER."

In respect to electric lighting matters at Cohoes, N. Y., reference to which is made elsewhere, we might add that the contract calls for the maintenance of 100 arcs, to be paid for at the rate of $1,000 per month.

THE value of the Worcester (Mass.) Gas Light Company's property is thus returned: Real estate, $126,000; manufacturing plant, $183,000; street mains (40 miles), $220,897; meters, $11,514. Street mains were added to by six miles of pipe in year ended July 31, 1888. In 1886 the sendout was 81,807,000 cubic feet; 1887, 87,613,000 cubic feet; 1888 (year now ends July 31), 101,500, or a gain of 15.75 per cent. The meters in use number 3,286.

HOW TO CALCULATE BRICKWORK.—Of course, we do not suppose that our readers will glean anything very new in the following; but still these hints may at some time or another to someone prove valuable. Ordinary bricks are about 8 inches in length, and, with the mortar joint, about half that in width, so that each brick on the flat will give a horizontal surface of about 32 square inches, or 4½ bricks will cover a square foot. As laid ordinarily there are nine courses to every 24 inches, or 4½ to the foot—4½ courses with 4½ bricks to the course give 20¼ bricks to the cubic foot. Waste, cutting and closer joints will easily require an allowance of 21 bricks per cubic foot, which will be found a very convenient figure for estimating the number of bricks required for a wall of a given size and thickness, as it thus becomes unnecessary to find the cubic contents of the wall, but merely to multiply its face area, or the product of its length and height in feet by seven-fourths of its thickness, which, as the thickness is always some multiple of 4 inches, is a very simple process. For instance, a 20-inch wall 40 ft. long by 30 ft. high has a face area of 1,200 square feet, and as it is five times 4 inches in thickness, it will require 5 times 7, or 35 bricks per square foot of face, or 42,000 bricks altogether.

THE United Electric Improvement Company on November 7th filed in the Camden (N. J.) County Clerk's office a certificate of the full payment of its capital stock.

AT the annual election of the Rahway (N. J.) Gas Light Company, held on the 5th inst., the following officers were chosen: President and Treasurer, J. R. Shotwell; Vice-President, Wm. C. Squier; Secy., Engr., and Supt., Walter B. Houston; Directors, J. R. Shotwell, W. C. Squier, Wm. Mershon, W. B. Houston, Jas. Vanderhoven and Isaac Osborne. We are more than pleased to say that, under the judicious management of those who two or three years ago succeeded to the control of the Company, its business is being rapidly developed. The Council that foisted on Rahway a most inefficient system of electric street illumination has been pretty well dismembered, and with the debt incubus on the city being gradually worn down, it needs not the foresight of a true prophet to assert that Rahway will speedily become what, owing to location and natural advantages, it should have been long ago, one of the busiest cities south and west of Newark on the New Jersey line of the Pennsylvania Railroad. We are sorry to have to say that the young and enterprising Secretary and Engineer of the Company—Mr. Walter B. Houston—was attacked this summer by what seemed to be a most serious illness. But a naturally sound constitution finally prevailed over the enemy, and now he is once more at his post ready as ever with the soft answer which dissipates the wrath of the indignant consumer.

THOSE who attended the Toronto Convention could not fail to have noticed the two brilliant gas lamps which gave such a splendid illumination over the footwalks in front of the showrooms of the Toronto Gas

Stove and Supply Company, 136 King street, West. These lamps were specimens of the new Gordon type, recently perfected by the inventor, who has been connected with the Siemens-Lungren Company, of Philadelphia, for some years. While not in a position to speak from continued personal observation with reference to the efficiency of the Gordon lamp, we nevertheless have conversed on the subject with those in whose opinion we have the greatest confidence, and their verdict in respect to its merit is unqualifiedly favorable. At all events, the illumination in front of No. 136 King street, West, was at once effective and pleasing; in fact, it left nothing to be desired, and it would seem as if the Gordon street lamp had a long lease of life before it. The Rossin House illumination—that is, as to the dining room and both entrances to the building—also once more emphasized the virtues of an old friend, the Lungren lamp. It would seem a trifle like gilding gold to speak of this favorite critically now, but as one can scarcely have too much of a good thing, we may perhaps be excused for saying that the Rossin House dining room was never really illuminated until the Lungren lamp had a chance thereat. Certainly, the illuminative effect obtained from the six 16-foot Lungren lamps was far more pleasing than that formerly obtained from the 8 arc lights that lighted the dining room. The porch lamps (4 each in the two entrances) also acted most effectively.

BROTHER BOARDMAN seems to have everything arranged in Macon for permitting his customers to make their choice of a lighting medium from many agents. To show that we are not far out of the way in this conclusion we submit the following, from the Macon *Evening News* of the 7th inst.: "The new incandescent light of the Macon Gas Light and Water Company shone brilliantly last night in various parts of the city, and elicited much admiration. The light is beautiful and gives a soft yet very bright glow that illumines with considerable power. Arc and incandescents were both burning last night. The plant is now in successful operation, and Macon will be furnished an electric light that will be a success in every particular. This new plant represents an investment of $50,000, and is situated at the works of the Gas Company near the foot of Mulberry street. There are 500 incandescent and 35 arc lights operated by an engine of 100-horse power, on which 35 more arc or 350 incandescent lights can be placed, as the demand for them requires. The arc sheds a light of 2,000-candle power, and the incandescent has 20-candle power. The main room in which the machinery is situated is built of brick in a splendid manner, and is 40 by 60 ft. inside measurement, and 16 ft. high between joists; the boiler room is 31 ft. by 35 ft. inside measurement, and 16 feet high. Twenty arc lights have been erected at the dummy line park, and several others are stationed about the city, while the patronage for the incandescent is growing quite large. The Macon Gas and Water Company show their faith in the future prosperity of Macon by their works. Their gas and water plant in this city represent an investment of $400,000, and this new electric plant stands for $50,000 more, Twelve miles of new mains have been laid this year, including a new 14-inch pumping main from Waterville to the reservoir. A splendid new water and oil gas apparatus on the improved Martin pattern has just been erected in order to enrich the high candle power coal gas supplied to the public. By its aid a 25-candle power gas is furnished which is devoid of an excess of carbonic oxide. The new gas plant has a daily capacity of 250,000 cu. ft., and the old plant operated in connection with the new has a capacity of 150,000 cu. ft., or a total of 400,000 cu. ft., which is large enough for the demand of Macon for the next 20 years, even though her growth becomes extremely rapid and large. The Company is prepared to give Macon a splendid gas and electric light, as also a water supply. It already has one of the finest light and water plants in the South, and its excellent service grows better every year. It will not hesitate at any expense to accomplish this end. The Company during the past 12 months has made some costly and remarkable improvements, and is certainly entitled to the liberal patronage of the public." Right you are, Mr. Reporter.

THE Siemens-Lungren Company, having abrogated the rights formerly owned by the Siemens-Lungren Gas Illuminating Company and the Western Siemens-Lungren Company, of Chicago, wishes us to say that it takes this method of informing the gas fraternity in the Western States that hereafter all orders are to be sent direct to the Company at Philadelphia. Orders that may have been sent to Chicago, and consequently have not been attended to, will receive prompt attention if duplicates are sent to the Philadelphia home office.

DEATH OF DR. DAVID HOSTETTER.—The life of the late Dr. David Hostetter, who died in this city on the afternoon of the 6th inst.—his death was accelerated by a surgical operation performed in the hope that the knife would remedy a diseased condition of the kidneys—falls little short of the marvellous, and as he had long been prominently identified with the gas interests of Pittsburgh, we append the following summary of his wonderful career, premising our statement with the remark that we are indebted to the courtesy of Secretary McClelland, of the Pittsburgh Gas Light Company, for our knowledge of the facts. David Hostetter was born in Lancaster county, Pa., Jan. 23, 1819, his father being a prominent physician of the locality. His early years were spent on a farm, but being an observant and retentive lad, he perceived that which was going on about him and retained the knowledge so absorbed. His youthful ideas were trained in the ordinary country school, then, indeed, of a very primitive type; but with plenty of courage in himself, in his 16th year he entered the employment of a Lancaster shopkeeper—a man named Hager—as an errand boy, graduating therefrom 7 years later, in the meantime, however, rising steadily in Hager's estimation until he became the latter's business manager. Our subject left Hager in order to engage in business on his own account, and his venture prospered fairly well. On the breaking out of the California gold fever young Hostetter, catching the infection, sold out his business, and, on April 15, 1850, set out from New York for the modern El Dorado. The steamer route from New York to the Isthmus of Panama proved fair enough traveling; but the Isthmus break, which had to be traveled on mule back, involved a delay of three months. Deceased, in his later years, delighted to rehearse this experience. In the party that made the remainder of the trip from Panama figured two other men—Garrison and Ralston—whose names are now identified with the financial interests of the country. Arriving in San Francisco, Dr. Hostetter embarked in the grocery business, but in less than one month his possessions were completely wiped out by the famous fire of 1850. Failing in his attempt to gain another foothold, the Doctor returned to Lancaster (Feb., 1851), taking service as a paymaster with McElroy & Clark, who were engaged in building the Pennsylvania Railroad—a puny weakling then, far unlike the great corporation of to-day. In 1853 he, in conjunction with Geo. W. Smith, conceived the idea of bottling on a large scale an original medicinal preparation which had long been prescribed by his father for his patients who suffered from stomach troubles. Pittsburgh was chosen as their base of operations, and during the life of the firm (Mr. Smith died in 1884) their specific became a household word, and millions of dollars were amassed by them from its sale. The wonderful spread of the fame of the remedy was almost solely due to the advertising methods initiated by Dr. Hostetter. To mention the other enterprises within and radiating from the Smoky City with which deceased was identified would simply be to publish a directory of the place. Suffice it, then, to say that he was largely interested in the artificial and natural gas supply of Pittsburgh—for 18 years he presided over the Pittsburgh Gas Company, and was a director and stockholder in the Allegheny City, Consolidated and East End Companies—but disposed of his holdings in the latter respect some months ago. His struggles with the Pennsylvania Railroad Company, in connection with the piping of oil from the Millerstown fields to Pittsburgh, are historical; and ended with victory for the Doctor. In 1877 he sold out all his oil interests to the Standard Company. If we mistake not the Doctor represented Pittsburgh at the initial meeting of the American Gas Light Association, but subsequently resigned from that body. His fortune is into the score of millions; and, strange to say, at the time of his death carried life policies in various companies to a total of $360,000. His wife (formerly Miss Rosetta Rickey, to whom he was married in Cincinnati, July 13, 1854), four sons and a daughter survive. Deceased was a man of great courage, self reliance and activity, and his staunchest friends were those who had the best opportunity for studying closely his personal traits. These all bear testimony to his honor and worth.

THE adjourned meeting of the Gas Commissioners, which was to have been held in Boston on the 8th inst., for the purpose of a further hearing on the petitions of certain companies for the right to manufacture water gas in Massachusetts, was again put over to December 6th.

MR. JNO. D. ADAMS, President of the Pulaski Gas Light Company, of Little Rock, Ark., has given notice to the consumers that hereafter the net price per thousand cubic feet is to rule at $2.50, provided, however, that bills are settled during the first 5 business days of each month. This proposition ought to receive a large majority.

THE popular vote in Hamilton (Ohio) on the proposition to issue bonds to pay for the construction of a municipal gas works in that city resulted as follows: In favor, 2,412; against, 59. The voters may yet rue this action.

[Official Report.—Revised by the Secretary.]

Concluded from page 316.

Sixteenth Annual Meeting of the American Gas Light Association.

Held at Temperance Hall, Toronto, Canada, Oct. 17, 18 and 19, 1888.

Second Day—Morning Session.

The Convention was called to order at 10:30 A.M.

The following additional applications for membership were received:

Active Members.

Bell, H. J., Engineer, Camden, N. J.
Chadwick, H. J., Treasurer, Lockport, N. Y.
Higby, W. R., President, Bridgeport, Conn.
Pearson, Jr., W. H., Superintendent, Toronto, Ont.
Slater, Jr., A. B., Superintendent, Providence, R. I.
Stoddard, C. H., Prest. and Treas., Brooklyn, N. Y.
Thomas, M. B., Manager, Dundas, Ont.

Associate Members.

Norton, H. A., Manager, Boston, Mass.
VanWie, P. G., Manager, Cleveland, Ohio.
Wright, W. S., Manager, Chicago, Ill.

Mr. Nettleton—I would like to inquire if the gentlemen whose names have just been read as applicants for membership are to be voted for at this session. We have adopted a Constitution, in accordance with which all applications for membership must be received by the Secretary ten days before the meeting. If that Constitution is in force, I would like to inquire how those gentlemen can now be voted for. For one, I shall be glad to see them elected members, but I want them to come in in the proper way; and if the new Constitution is in force, I for one would like to live up to it.

The Secretary—You did not live up to it yesterday in receiving members.

Mr. A. C. Humphreys—Yesterday we voted for new members before the new Constitution was adopted.

The Secretary—But there were others voted for afterward.

The President—I will refer these applicants to the same committee, and let the committee report. We will now take up the paper by Capt. Ross.

Capt. Ross—Before proceeding with the paper I intend to submit, I wish to tender my thanks to the gentlemen composing the Executive Committee for their kindness, and for the compliment extended to me in inviting me to address the Association on the subject of the steam stoker. In view of the fact that I am not a professional gas engineer, I esteem it an honor and a privilege to be permitted to address an Association composed of gentlemen of the high order of intellectual and scientific attainments necessary to promote the rapid development of the vast industries confided to your care. I wish to say, Mr. President, that in this paper I have devoted considerable space to the mechanical construction of the machine; but, owing to the courtesy extended to me this morning in allowing me to take precedence in reading the paper, and in view of the fact that a large proportion of the gentlemen constituting this Association have probably seen the machine at work, and of the fact that they have been in a practical working condition for a period of seven years (although under disadvantages to which no other steam machine has ever been subjected), and in view of the further fact that we are willing to give a written guarantee as to their efficiency, I deem it unimportant to go into the details in regard to their construction. But in order to enable those who have never seen the machine to form an intelligent idea of its construction, I have brought here some descriptive pamphlets, with a cut illustrating the machine, taken from a photograph of the machines as they are working in the city of Cincinnati. I will therefore omit the portion of the paper dealing with the mechanical details, to save time.

Capt. Ross then read his paper on

THE ROSS STEAM STOKERS AND IMPROVED CHARGER.

I can hardly claim that the subject-matter of this paper will prove interesting because of its originality, for from the very first practical demonstration of the feasibility of profitably producing and distributing coal gas the desire for some less laborious and expensive method of charging and discharging retorts has apparently been uppermost in the minds of our engineers.

First taking shape in the brain of Brunton over 50 years ago, his ideas were from time to time modified, improved upon, and added to successively by Grafton, Malam, Bouneville, Somerville, Foulis, West, Rowland, and at least 25 others, some of them the brightest and most intelligent men of our day, each in turn hoping and believing that he had at last solved the difficult problem, but each in turn being disappointed over results when called upon to practically demonstrate the correctness of his theories.

So frequent have been such practical failures in the broad field of original conception, that even those most interested in the success of any new invention are not disposed to look upon it with favor until they have been educated up to an understanding of its merits and a thorough and complete comprehension of the principles upon which its operations are based; and hence, even in the most meritorious cases, the inventor has to assume the role of special pleader for a recognition of the benefits which he proposes to confer.

Experience has taught us that there are no exceptions to this rule, no evading these conditions; and, in consequence, the advocate of any change in existing methods must be content with slow and sometimes disheartening progress, until he has not only clearly demonstrated the fallacy of theoretical objections, but has met and conquered other adverse influences and conditions by an actual practical demonstration of the correctness of his views and the capabilities of his invention. Considering the conservative character of the industry affected by mechanical stoking, the requirement of a wide departure from long established methods, and the changes in construction necessary to its profitable operation, *nothing less will be accepted as conclusive, nothing more should be required.*

I shall first, but briefly, refer to these theoretical objections, give a condensed description of the machines and methods of operating, and then submit for your consideration an expression of the views of engineers who have abandoned the "waiting policy."

I am aware that, in the light which up to that time had been shed upon the subject, the theoretical objections to the charging machine were not entirely unreasonable; in fact, one of the most prominent and progressive engineers in this country, and one who has since become an enthusiastic advocate of mechanical stoking and the projector of the most thorough and complete system ever inaugurated, was the first to suggest objections which I have since heard repeated over and over again, but which I have shown, by the long continued and practical operation of the machines, to be utterly groundless.

These objections were in the shape of expressed doubts as to the practicability of evenly distributing the coal; that the concussion incident to the blast might fracture weak retorts, or cause a variation in the seal; that the coal would be packed so as to prevent the free egress of gas generated; that the condensed steam would moisten coal and interfere with the thorough carbonization; that the weight of charge would not be gauged with sufficient accuracy to maintain the desired uniformity of production, etc.

I shall, as briefly as possible, answer these objections. By intelligently directed successive blasts the coal is projected into the retorts exactly as it would be by shovels—the first portion, meeting with no resistance, is deposited at the extreme end of the retorts, and each succeeding charge striking that immediately in front causes the whole to be evenly distributed. The conduit of the hopper occupying less than one-half the superficial area of the mouthpiece, it must be evident that no pressure could be maintained within the retort.

A series of tests made at the works of the Cincinnati Gas Company demonstrated the fact that the concussion never occasioned to exceed one-tenth of an inch variation in a pressure gauge placed on nipples screwed into the stand-pipes; and even this slight variation invariably occurred only for an instant during the last blast, after the bulk of the charge had been deposited.

If a charge has been evenly distributed it is evidence that there has been no "packing," for each particle falls into its position on the bottom only by the force of gravity. In no single instance has a retort ever been "blocked;" and while a careless operator might cause irregularity in distribution, the same may be done with either scoop or shovel, but is less likely to occur where all the charging is done by one single individual, and he alone held responsible for its efficiency.

Of the total volume of steam required for a charge, not exceeding 10 cubic feet could be retained in the retort, representing but 1 cubic inch of water—a volume so small that it would be volatilized and expelled before the lid could be closed.

The hoppers are gauged by ascertaining the number of cubic inches occupied by any given weight of coal to be charged; so that, practically, there can be no variation except that due to a difference in the size of the particles, or variation in the weight of the coal used—it certainly can be no greater than that due to the use of a scoop or any other receptacle gauged by measurement. The actual difference in weight of

coal deposited in bins of the East-End works of the Cincinnati Gas Light Company and that theoretically charged during a period of six months varied but 1.33 per cent., and the greatest observed variation in any one month was 2.21 per cent.

The *discharging machine* consists of a carriage composed of longitudinal and transverse eye-beams, supported on journals near ends of axles upon which the flanged wheels are keyed. Upon one side of the carriage are located the upright boiler, water tank, feed pump, propeller, horizontal engine, and water cataract or governor. This engine actuates the traveler to which the drawing rakes are attached, the movement being accomplished by means of a rack connected with engine piston, the rack working into a pinion keyed to a longitudinal shaft, upon the end of which is keyed a drum to which are attached the ends of two chains, coiled in opposite directions and passing over grooved wheels in vertical frame on either end of the carriage; the other ends of the chains being attached to the opposite ends of the traveler propel the rake attached thereto, back and forth at will of the operator, who handles the lever. The speed of the traveler can be perfectly controlled by a valve adjustment of the cataract.

A counter-weight attached to an adjustable sliding bar, with the grooved rollers supporting the rake beams, can be so adjusted as to hold them in equilibrium at any point during the stroke.

The rake-beams consist of angle iron of suitable dimensions, to the inner ends of which are attached steel rake-heads, of a size and shape suitable to the contour of the retort. The controlling valves and levers are all located within convenient reach of the operator, and at such a distance from the retorts that he is not subjected to any annoyance from the heat and smoke, and can clearly observe and perfectly control the vertical and horizontal play of the rake.

The machines are operated in substantially the following manner:

An assistant opens the lids of three retorts, and, while cleaning the mouthpiece and auguring the stand pipe, the operator having run the discharger into position opposite the retorts to be drawn, with his right hand he controls the vertical movement of the rakes, and with his left the longitudinal motion or length of stroke. He can with the greatest ease retard, stop, or reverse the stroke; elevate, or depress, the rake at any desired point, and completely discharge any retort in from 15 to 25 seconds. After a retort has been drawn the rake beam is detached from the traveler and sustained by pin upon vertical frame; and the rake corresponding to the position of the retort to be next drawn is attached to the traveler and the drawing operation repeated. After the open retorts of a bench—usually three on each side—have been discharged the machine is propelled along the track to a point opposite the next retorts to be drawn, and the operation repeated until the round is finished.

It is true that the charging machine, when first introduced to public notice, was not so perfect as it now is; but this was not due to any inherent defect in, or objection to, the principles involved in its construction, but rather to the mechanical arrangement of its parts, necessitating an excessive expenditure of muscular force and a delay in its manipulation, incident to a new adjustment for each retort charged, which detracted from its efficiency and seriously interfered with its use as a "running mate" to the discharger—an acknowledged success from the date of its introduction.

The improved charger consists of a rectangular carriage, composed of heavy eye-beams, mounted on axles to which are keyed the flange track-wheels. The vertical boiler, steam reservoir, water-tank, feed-pump and disc-engine for propelling, are all located upon one side of the platform; upon the opposite side are located the charging hoppers, mounted in a vertical frame of wrought iron tubes, with wrought iron top, securely braced and supported upon axles, to which are keyed the wheels running upon rails laid across the platform of main carriage. Between this hopper and the boiler is located a steam cylinder for moving the hopper back and forth, accomplished by a reciprocating movement imparted by a rack attachment to piston gearing, and to the shaft of which is secured a drum over which coils a wire rope in reverse directions. By the movement of a lever the hopper is moved forward to front of benches for the purpose of charging, or backward to the end of traverse rails, for the purpose of refilling the hoppers with coal from the storage bins.

There are now three separate and distinct hoppers varying in forms, but each of the exact dimensions necessary to carry the required weight of charge, so arranged in fixed positions that their conduits will enter the three retorts simultaneously.

The top of the upper hopper and top of conduits leading to lower ones are on the same level forming a common receptacle, and these latter so constructed as to contain the exact weight of coal necessary to fill the hoppers for the middle and bottom retorts. To each hopper conduit a door is fitted at the bottom, opened and closed by lever and self-acting catch. From the horizontal blast-pipe at the bottom of each hopper ten ⅝-inch horizontal nozzles are connected, through which, when the steam by successive blasts is discharging against the coal projects it into the retort. The blast-pipes at bottom of each hopper are connected with a vertical 3-inch steam stand-pipe, and it is in turn connected to main supply pipe by a swivel-jointed connection, and a full way quick-opening valve, the handle of which is located within easy reach of the operator.

The steam reservoir serves as an accumulator to maintain the volume of steam necessary to give a uniform pressure during the operation of charging, and also serves to retain a uniform water line and relieve the boiler from any sudden strain or shock due to the quick opening of the valve. The working pressure is ordinarily from 60 to 80 pounds, depending upon the length of retort and weight of charge.

The construction and arrangement of the various parts are of so plain and simple a character that any ordinary stoker, after two days' practice, can operate it perfectly. The wearing parts are strong, and seldom need other attention than oiling, packing, etc. These machines have been in constant and continuous operation at the East End station of the Cincinnati Gas Company for the past four years, and are to-day in practically as good a condition as when first placed in position.

I am, therefore, warranted in assuming that under the most unfavorable circumstances the depreciation cannot exceed 5 per cent.

In the practical operation of charging the machine is moved to its required position opposite the retort previously discharged; the movement causes the hoppers to move back underneath the chute of the storage bins, which are located upon either side of the retort house, the assistant raises the check-gate and the coal slides down until the upper hopper and the conduit leading to the lower ones are all evenly filled; the controlling lever is then changed, and the hoppers move forward until the hopper conduits enter the mouthpieces of the retorts and stops automatically at the proper point. The operator has in the meantime pressed the latch securing the trap at bottom of conduits, and the coal falls into its hopper. The operator then, by three or four times quickly opening and closing the full-way valve, projects the coal into the retort. By the exercise of ordinary intelligence in graduating the duration and force of each blast, he can distribute the charge with as great, if not greater uniformity than is ordinarily accomplished with scoop or shovel—the actual time occupied in charging three retorts seldom exceeds five seconds. The operator again reverses the lever and the hoppers move backward, and, at the same time, starts the propelling motor, which moves the machine to a point opposite the retorts to be next charged, by which time the hoppers are in a position to be again filled—the whole movement occupying not to exceed two minutes.

But the experimental stage having long since been passed, it will, no doubt, prove more satisfactory to herewith submit the testimony of a gentleman who for 20 years has been connected with, and now stands at the head of the manufacturing department of the Cincinnati Gas Light and Coke Company.

OFFICE OF THE SUPT. MAMUFACTURE, CINCINNATI GAS LIGHT AND COKE COMPANY, October 8, 1888.

CAPT. A. Q. ROSS, Cincinnati, Ohio:

DEAR SIR:—In response to your request that I briefly state what your stoking machines are doing in the works under my charge, what they are capable of doing, and what observed defects, if any, there are in their practical operation, I have to reply. At the old station where we are now doing but a limited amount of work we are using the drawing machines with satisfaction and profit. We are not there using the chargers, because of the impossibility of locating the necessary coal storage bins.

At the East End station, where most of our work is being done, we are using the stokers exclusively.

The maximum duty thus far assigned a pair of machines has been 28 benches of 8's—224 oval retorts, 15 in. by 25 in. by 9 ft. 6 in. long, charged every 5 hours with 333½ pounds of coal, consisting of about ¾ Yough. and ¼ W. Va. bituminous coal. This requires 45 retorts to be drawn and charged every hour, which is usually accomplished in 40 minutes. To perform this duty requires one man on the discharger and two on the charger, together with seven lid men on each watch of 12 hours.

The general arrangement of that house permits of the following described system of work:

If the coal is of suitable size when delivered at the landing it is then loaded into cars, drawn up the incline, thence run over and dumped into storage bins on each side of the retort house. When taken from the yard the coal is elevated to track level by hydraulic elevators and discharged as before. From the storage bins the coal runs down a chute by gravity into the machine's hoppers, charged into the retorts from

which the coke is drawn by the discharger—that from the two middle retorts going into the generator furnaces, and the others into cars located in the cellar below, where it is quenched, run out and dumped into the coke bins, from which the supply for public use is drawn. Neither the coal nor resultant coke is touched by hand or shovel from the time it leaves the river until the coke is delivered on the consumer's premises. The average yield is 5.07 cubic feet per pound, representing a production of 908,500 cubic feet of gas in 12 hours.

The following exhibit represents the actual cost of production, as shown by several months' operation with the improved charger:

One operator on discharger	$3 12
" " " charger	2 82
" assistant	2 32
Seven lid-men, opening lids, etc	14 00
One generator furnace man	1 50
Three coke men	4 50
Four coal men	6 00
1,750 gals. of water	14
Cylinder and lubricating oils, packing, etc	37
Renewals of steel rake-heads	07
" " " chains	07
" " " rake-beams	04
Fuel, 65 bush. of coke, at 5 cts	3 25
Total	$38 20

Thus eighteen men in conjunction with the machines produced 908,500 cubic feet in 12 hours at a cost of 4.2 cents per thousand.

During a period of about three months, while the charging machines were being altered to the new form, we made tests to determine the cost of carbonizing the same weight of coal by manual labor; and upon that test the following estimate is based:

21 stokers at $2.50	$52 50
7 helpers " 2.25	15 75
5 coal-men, bringing in coal, at $2.00	10 00
1 weigher	1 25
1 furnace man	1 50
3 coke-cellar men, at $1.50	4 50
Gas used in yard at night	50
	$86 00

9.47 cents per thousand, or a difference in total expense of $95.60 per day, or 5.27 cents per thousand.

At the West End, or old station, where we have continuously used only the drawing machine and charged with scoop, we last winter discharged 30 benches of sixes (180 retorts,) every five hours. The retorts are not on the same vertical line and thus necessitated changing the position of the machine for each retort drawn; but with all this trouble, and only 16½ feet space from mouthpiece to side wall, one man discharged the allotted number of retorts in from 30 to 40 minutes. The charge was 256 lbs., giving a yield of 5.11 c. ft., or 1,130,000 cu. ft. per day.

The items of expense for 12 hours were as follows:

1 operator on drawing machine	$2 50
8 stokers, charging, etc., etc., at $2.25	18 00
3 coal men, breaking and distributing, at $2.00	6 00
1 coal weigher	1 25
1 furnace man	2 00
2 coke-cellar men, at $2.00	4 00
700 gals. water for discharger	05
Renewals of chains, rake-heads, etc	17
Cylinder oil, waste, etc	11
Fuel, coke 25 bush. at 5 cts	1 25
Total	$35 33

Thus with 16 men was produced 565,000 cubic feet in 12 hours, at an expense of 6¼ cents per thousand.

The old system of hand labor, in vogue at that works previous to the introduction of the discharger (3 men to 5 benches, or one bench of sixes every hour) called for the following expenditure for 12 hours' work:

18 stokers, at $2.50	$45 00
3 coal men, at $2.00	6 00
3 coke-cellar men, at $2.00	6 00
1 coal weigher, at $2.00	2 00
Total	$59 00

or 10.44 cents per thousand, an increased expense of $47.34 per day.

In my judgment your discharger can be operated with sufficient profit to justify its immediate introduction into any works having not less than eight benches of sixes fired; in which case the expense of labor for carbonization would be $27.30 per day, while to perform the same labor exclusively by hand would call for an expenditure of $38.00 per day.

We have operated but four benches of eights at our East End station, with a pair of your machines, charging every five hours with 333⅓ lbs. of coal, or 6.4 retorts per hour.

The expenditure in connection therewith for 12 hours was as follows:

1 engineer operating both machines	$2 50
1 lid man	2 00
1 coke-cellar man, clinker, furnaces, etc	1 50
1 coal man	1 50
Water, 1,250 gallons	10
Oil, waste and packing	09
Coke, 25 bush., at 5 cents	1 25
Total	$8 94

To perform same work by hand would involve an expenditure of $12.50, as follows:

3 stokers, at $2.50	$7 50
1 helper, " 2.00	2 00
1 coke-cellar, at $1.50	1 50
1 coal man, " 1.50	1 50
Total	$12 50

I never observed any defects in their practical operation. The depreciation is mainly confined to the chains actuating rake-carriage, about 4 ft. of the inner end of the beam, and the steel rake-heads; but in no case exceeds in value the depreciation of the implements used in drawing and charging by hand. Their use has never injuriously affected the retorts, and I have never been able to observe any difference in yield attributable to either system. Very respectfully,

N. G. KEENAN, Engineer.

The following is from a well-known Engineer, whose requirements called for the constant employment of but one machine.

OFFICE OF THE BROOKLYN GAS LT. CO.,
BROOKLYN, N. Y., Sept. 20, 1888.

CAPT. A. Q. ROSS:—

MY DEAR CAPTAIN:—I have yours of 19th inst. in regard to a further expression of my experience in the operation of your steam stoker, and have simply to add, to what I have already written you, that during the past summer we have been making certain changes in our works, by which we have been temporarily deprived of the use of the machine, and an increase in our pay-roll for the additional number of men employed shows plainly the value of the steam stoker.

Respectfully yours, JAS. H. ARMINGTON, Prest. and Engineer.

The following certificate is from the President of the New York Consolidated Gas Company, whose works are without the advantages of a stage flooring:

CONSOLIDATED GAS COMPANY OF NEW YORK,
NEW YORK, October 12, 1888.

DEAR SIR:—The eight drawing machines supplied by you to the Fourteenth and Eighteenth street stations of this Company have been in constant use in these two stations for several years past, working to our entire satisfaction. The saving in time and labor by their use is considerable, and the comfort of the workmen greatly promoted. They are a valuable improvement on the old method of drawing by hand.

Yours truly, JAS. W. SMITH, President.

To CAPT. A. Q. ROSS, Gen'l Manager U. S. Steam Stoking Co.

And this from the Vice-Rresident and General Manager of the Boston Gas Light Company—a gentleman who has, to a greater extent than any other American engineer, had an opportunity of observing the various systems of retort house labor throughout Europe as well as in this country:

THE RICHELIEU, MICHIGAN AVE. BOULEVARD,
CHICAGO, October 14, 1888.

A. Q. ROSS, Esq.:

DEAR SIR:—I regret that I am prevented from attending the Toronto meeting, as I had intended to be present and to have taken part in the discussion which might naturally follow your paper. My views as to the value of your discharging machine are well known and unchanged. No large gas company can afford to draw its retorts by hand, provided they can introduce your machines into the retort house; and your experiments in the direction of shortening the drawing machine have now made it available in places where it could not formerly be used. The

Boston Gas Company has recently bought two more machines from your Company, and hopes next year to introduce a third. As to your charger, which has just been introduced, I am not yet prepared to speak with that decision which can come only from experience. I can, however, say this—that we are using one in our Commercial Point works, though not yet to the extent of its full capacity, and that it promises to do extremely well. It certainly charges the retorts with wonderful quickness; but whether it will fulfil every other requirement upon it I cannot of course speak with assurance yet. I will say, however, that I shall be greatly disappointed if it does not work with sufficient accuracy and reliability to make it a very valuable complement to the discharger.

Yours truly, M. S. GREENOUGH.

And this from a gentleman who will be at once recognized as one of the leading engineers of this country, and now the honored President of the Chicago Gas Light Company:

CHICAGO, ILLS., Sept. 26, 1888.

A. Q. ROSS, ESQ.:

DEAR SIR:—The drawing machines which were placed in our South Station about a year ago, have been working *continuously*, and have fully come up to our expectations. The saving of labor from their use has been quite four cents per thousand cubic feet on the gas manufactured at that station. Yours truly, THEOB. FORSTALL, Prest.

These statements are so full, complete and comprehensive that it leaves little or nothing more to be added in the way of details.

As the world grows older and material wealth increases there is a natural and very proper demand for additional comforts and conveniences; and in no direction is this more apparent than in the ever increasing demand for the more brilliant illumination of our homes and highways. In fact this increase of light is now regarded as one of the prime necessities of our advanced civilization.

These conditions have been realized and promptly met by the manufacturers of oil lamps, placing *those* wares upon the market in the most beautiful and attractive form; by the oil producers in the improvement of their refining processes, until their product is now absolutely safe—if properly handled; by the advocates of electric lighting, lavishly expending both time and money in efforts to secure for their favorites public approval; and last, but by no means least, the water gas promoters are bidding high for public patronage by increasing the light giving properties of their product beyond the coal gas range.

There appears to be but one direction in which coal gas engineers can turn with the hope of successfully competing with these formidable rivals, and that is to supply the equivalent of an equal volume of light for less money.

To accomplish this result the cost of production must be reduced, and it now only remains to determine in what direction this can be best and most expeditiously effected. These machines having been subjected to the crucial test of practical experience and the results laid before you, I need not encroach upon your time and patience by giving further expression to my own judgment and belief in the future possibilities of steam stoking; but I do feel that if I have clearly shown you that the price of the machines can be saved by working them for less than six months—up to their maximum capacity, and that the cost of labor expended in placing gas in the holder can be reduced—as it has already been—to less than four cents per thousand, no apology is necessary from me for having advocated their adoption as the means of producing an improvement in the hygienic conditions of your works; the acquirement of steadier and more reliable service, and the attainment of an economy in production never before equaled.

Discussion.

The Secretary read the following letter:

THE CINCINNATI GAS LIGHT AND COKE CO.,
CINCINNATI, O., Oct. 16, 1888.

C. J. R. HUMPHREYS, Secy. American Gas Light Association,
Rossin House, Toronto, Canada:

DEAR SIR:—I have delayed until the last moment, hoping that I might be able to attend this meeting and, as you requested, take a hand in the discussion of the paper on "Steam Stoking;" but important business engagements here will prevent this anticipated pleasure. As to my personal views upon this subject "the proof of the pudding is in the eating." By their use we are to-day saving this Company nearly $50,000 per year, and putting gas into the holders at a figure that would astonish any engineer who may think he has struck "bed-rock."

Yours truly, A. HICKENLOOPER, Prest.

The President—Does any member wish to make any remarks upon the Ross Stoker, or to make any inquiry?

Mr. Harbison—I was quite interested in listening to the paper read by Capt. Ross. I would like to inquire what advance he has made within the past year, if any, with regard to being able to put the steam stoker into works that are sending out, say, a hundred million cubic feet per year? What prospect is there of its being introduced into works of that size?

Capt. Ross—I am glad to answer the question of the gentleman. The statements embodied in this paper relate to the practicability of making it profitable to put the machine into works running eight benches of 6's. The paper gives you the exact cost of charging and discharging that number of benches, and the labor incident thereto, including the investment on the machine. Of course we assume that every gentleman now understands the merit of the present method. The only change that I refer to as having been made is in reducing the length of the discharger to admit of its successfully working in a retort house with but 16½ feet between the face of the benches and the retort house wall. I would be pleased to submit to the gentlemen these figures. Of course, I am not, as I have stated, a professional gas engineer, and there may be very many questions involved in the use of this stoker that I cannot answer intelligently, but the testimony as to its use that I have read comes from practical engineers, and is the result of their experience based upon actual use. So far as the working of the machines is concerned, I will say that we will guarantee them to do precisely what we represent, so that any Company contemplating their purchase can run no risk, so far as that is concerned, because we will take the machines out if they do not do just what we represent. I know there are a number of companies in the United States which would be very glad to adopt them if their sendout would warrant the investment. Of course, those are questions that should be very carefully considered, as local circumstances might determine the utility of introducing them. I know one gentleman (I believe he is present) who has a sufficient output to warrant the introduction of the stoker, but unfortunately the output is divided between two works. There are, of course, disadvantages of that kind to be considered.

Mr. A. C. Wood—I would like to ask Mr. Ross if the charging machine is being used in any gas works excepting Cincinnati?

Capt. Ross—Yes; it is being used now in Boston. Mr. Greenough visited Cincinnati in company with Mr. Lamson, and saw the steam stoker at work, and made a contract with us to put the machine into his works to charge the entire 90 retorts with one man—that was about two weeks ago. Before putting up the chutes for delivering the coal, of course, we want to be satisfied as to the charger—the method of delivery now is temporary—through wooden tubes; but, of course, that does not affect the charger. The time of charging is from 5 to 10 seconds. The charging can be done much more rapidly than the discharging men can discharge.

Mr. A. C. Wood—Has not the charging machine been introduced into various works heretofore?

Capt. Ross—No; it has never been introduced in any works, excepting the Manhattan in New York.

Mr. A. C. Wood—Was it not discontinued there?

Capt. Ross—It was discontinued there for the reason that it was not perfect; and if the gentlemen who managed the gas works had owned the machine they could not have done more to make it work. It had a magnificent opportunity there. They were faithful to their trust, and did all they could, but it was a failure. Now, however, it is not a failure. It is a practical and demonstrated success. Of course, there are difficulties that may be encountered. I beg to call attention to the fact that these machines are without exception subjected to the worst possible character of laborers that ever a piece of steam machinery was subjected to. We have represented to you that you can employ an ordinary stoker to run the machine. So you can. I ask you to go into the retort house for yourself and examine the condition. Remember that this machine does not stop with the bell, but it works for 18 or 24 hours each of the 365 days in the year. You take an ordinary laborer from your benches and put him on the machine, and subject it to the grit, coal, soot, dirt, and everything of that kind, and yet absolute experience has demonstrated, according to the statements of gentlemen in whom you all must have confidence, that those machines have been worked at the Manhattan gas works for nearly seven years, and have also been working in Cincinnati, and yet are as good to-day as when they went in, with the exception of the bearing points, which necessarily have to be replaced when worn out. You can use ordinary laborers, but of course it should have the supervision of some intelligent mechanic to look after it once in a while and see that the bearing parts are properly lubricated.

Mr. Cole—As a matter of comparison I will be pleased if some of the gentlemen from works making all the way from 50 to 100 million cubic

feet per year will inform us at what cost they are making gas in the retort house?

Capt. Ross—I do not desire to talk of the cost of the gas. I only speak of the difference between two processes—that is, making it with stokers or with the discharger alone, or making it with the charger and discharger alone, and the old method of discharging by hand. Of course I cannot discuss intelligently with you the question of making gas. I am only giving the experience, based upon absolute result, of those skilled in the profession, and do not make any statement as to the cost of producing gas.

Mr. Smedberg—In San Francisco, while we were sending out of the retort house about 1,200,000 cubic feet, our retort house labor, including all classes of labor contemplated in Mr. Ross' statement, was eleven cents; but we were, of course, paying higher prices for our stokers and helpers than those paid in the East.

Capt. Ross—But if you can dispense with one-half of the labor it would certainly effect a saving?

Mr. Smedberg—Undoubtedly.

Mr. Lindsley—Can the stoker be used in one-story retort houses, where there is no cellar?

Capt. Ross—Certainly. In the Manhattan works there were no cellars. We are now putting them in the Philadelphia works where there is no cellar, and also in the Cleveland works where like conditions prevail; also, at the old works in Boston, at the north end station, where the same remark would hold good.

Mr. Lindsley—Does the distance mentioned (16 feet between the bench and the outer well), suffice in that case?

Capt. Ross—16 feet 6 inches is sufficient. It would depend somewhat upon the distance from the height of the lower retort from the floor. If we can get the height so that the coke barrow will pass under the mouthpiece it will be practicable.

Mr. Scriver—Is it necessary to elevate the coal to the height shown here, so as to run it down the chutes?

Capt. Ross—It would only be necessary to raise the coal to the height of the top of the charger. The design which you see here was for the original charger, and the photograph is taken from that.

Mr. Scriver—Can the coals be thrown into the charger without elevating them.

Capt. Ross—Yes; but I believe it is more economical to elevate them. They can be elevated cheaper by machinery than thrown in by hand.

Mr. Scriver—In that case most of us would have to build our retort houses to suit the machines.

Capt. Ross—In a small house, of 10 or 12 benches, you can build one elevator at the end of the house.

Mr. Scriver—In our case at Montreal, where the coal sheds are on each side of our retort house, that would not be practicable.

Capt. Ross—I mean by that that one point of delivery for the coal, instead of having a series of bins, would be quite sufficient for a small house.

Mr. Scriver—Do you charge three retorts at a time?

Capt. Ross—Yes, practically. For instance, three conduits enter three retorts to be charged simultaneously—all being on one bench. Then the operator opens the valve of one of them, then of the second, and then the third. The charging time required is only from 5 to 10 seconds.

Mr. Scriver—At our works we are putting in nine retorts to the bench. I would like to know if a machine can be adapted to charge three retorts, one above the other, as we are setting them?

Capt. Ross—Yes; we are now charging nines in Cincinnati in the same way.

Mr. Scriver—I suppose Capt. Ross has no objection to hear the cons as well as the pros?

Capt. Ross—Certainly not.

Mr. Scriver—We have had no experience in running either the charger or the drawer; but from the testimonials read it would seem that the dischargers are giving very great satisfaction, while perhaps it is still a question whether the chargers are doing so well.

Capt. Ross—That is quite true.

Mr. Scriver—I do not wish to say anything against the charger—personally I cannot, as I have not had any experience with it; but when we are discussing a question we have to argue from all standpoints.

Capt. Ross—That is perfectly proper. Of course I could not consistently, under the circumstances, ask Mr. Greenough to give me a recommendation of the stoker. We prefer to wait, and after two or three months of trial we will know the results as far as Mr. Greenough is concerned. I would like to call the attention of the members to the certificate attached to the circular from Mr. Hunt, of Birmingham, England, in which that gentleman states he is paying 5 shillings per day for labor; but he is not, as he states, working the machines to their maximum capacity—he is only working 200 days in a year—yet he states that his saving is $2,500 on each machine.

Mr. Scriver—No one present would more gladly hail the advent of a successful charger than I would. The Company I represent would be glad to introduce such a machine. Unfortunately, strikes have occurred at our place on one or two occasions, and we find that stokers are the worst strikers that we have to deal with. If it were possible by the use of machinery to dispense with their services, we would be glad to use the machine. As I said yesterday, I enjoyed a somewhat extended trip on the other side of the water, and saw at the Beckton Station, London, a couple of stoking machines laid up high and dry in the works. I do not wish to say anything against the Ross machine; still, as I said before, it is necessary to argue this question from all points in order to get at all the facts. It is well for us to know what can be said against a machine as well as what can be said in favor of it, if we want to arrive at an intelligent decision. As I say, there were objections to machines, and they were not at work; and if there is any place in the world where stoking machines should or ought to be used, I should say it was there, for they are turning out a great quantity of gas. When I was there they were putting out 39 million cubic feet per day at one station alone. I expressed some little surprise, to the engineer who conducted me about the works, that they were not using the machine stoker, and he said that those machines cost more than they were worth to keep them in running order.

Capt. Ross—May I ask if they were not the West machine?

Mr. Scriver—I cannot tell you.

Capt. Ross—Our machines are not there; but they are working in Birmingham, England.

Mr. Scriver—I do not think that they are your machine; but if they are such very tender machines as they apparently were there I think it would prove a very expensive machine for any of us to adopt. For my part I would rather put up with the strikers.

Mr. Page—The subject of this paper presents three aspects—philanthropic, prudential and financial; but I believe that every gas manager is influenced by the first, because the hardest work, it seems to me, that is done by the men, is stoking—particularly in the summer time—whether it be in Canada, in the South, or in the Middle States. Therefore, any means by which labor-saving machinery can be substituted for the hardest manual labor ought to receive our earnest attention. I am told that in some works the average time that the stoker is employed is not over five years. Therefore a machine that can do his work is something to be hailed with joy. Next, prudential. I suppose most gas works are subject to strikes, and therefore a great industry is left to the mercy of men who, generally speaking, do not care for the company which employs them. Hence a machine that will take the place of the striker is something to be considered carefully and seriously. Third, financially. The statements made by Capt. Ross and the names read by him must be accepted by us all as substantial. We certainly cannot go back of them as to results. Capt. Ross has referred to the use of the machine at Birmingham. In England, in June last, at the meeting of the Gas Institute, I asked specially about the "Ross Steam Stoker." I was interested in learning (perhaps from patriotic motives, because I know it is a chief competitor of the West mechanical stoker) with what success it had been used. I was told that the discharging machine had been a success from the first, but that the charging machine was a failure. I was also assured by an official of the Gas Light and Coke Company that the discharging machine at the Nine Elms station, London, was an absolute success; that they could not get along without it; that they saved 60 per cent. of the cost of stoking by the use of the Ross discharger. During the present summer one of our honorary members (Mr. R. P. Spice) was in this country, and he, in company with Mr. Samuel Cutler, of London (who is largely interested in gas matters), made a special examination of the stoker at Cincinnati. Gen. Hickenlooper, the President of the Company, and the engineer of the works gave them ample opportunity to examine the machines. They saw the plant in operation. Their decision was that the charging machine was as thoroughly a success as the discharging machine. They saw, time and again, the charges put in and evenly distributed. They saw them make on the days that they were there 1,400,000 cubic feet with only nine men. The stoking work of that great retort house was being done by these machines. We saw the discharging machine, in nine minutes and fourteen seconds, take up every particle of coke cleaner than the average stoker takes it out with his hand apparatus. The charger deposited 300 pounds coal promptly and evenly. Reference has been made to the stoker at work at the Beckton station. I had an opportunity of seeing it last June in company with members of the Institute who visited the works to in-

spect that station. The charging machine was not in operation in consequenee of breakdown. It is the West mechanical stoker—the compressed air machine. Its use is attended with many difficulties. It often breaks down. But you could not take it out of that works. You could not buy it out of that works, for two reasons. The first is that while it is working it has an effect upon labor, at $1.25 per day for stokers. Second, it makes a large saving in labor. The West Company have, I believe, 130 machines in operation in large and small works. You know that Mr. West was formerly engineer of the Manchester gas works, but now he gives his entire time to the large Company which is building and putting up that apparatus. The comparative cost of the two is largely in favor of the Ross steam stoker. The comparative efficiency of the two is also largely in favor of the Ross steam stoker. There is no question about that. The Ross steam stoker is one of several which has been invented in this country; and the West one of many invented on the other side. I saw, in 1870, the Somerville steam stoker in operation at the Dublin works. If it had been pursued as thoroughly as Capt. Ross has pursued this and a success made of it, doubtless it would have been in general use. I think the fraternity owe Capt. Ross thanks as well as substantial support for his persistency in making a success of this stoker. Labor-saving machines in the retort house, and purification in closed vessels at the other end, will reduce coal gas making very quickly to the point which I have previously prophesied—when gas shall be put into the holder at *nil*.

Mr. Scriver—Mr. Page has spoken of the financial question. Would Capt. Ross have any objection to tell us about the cost of this machine—say for one stoker and one drawer, set up complete in the works?

Capt. Ross—You will observe we have advertised the price. The established price is $7,000 for the discharger and $6,000 for the charger; but there are certain additions. Modifications or radical changes are sometimes made necessary, and we have to charge the cost of making them, which is added to the price named. A standard machine, as delivered in the works, with the steam up and with the services of an expert to thoroughly instruct your employees as to its operation is $7,000, provided no radical change in the design is made necessary by the location.

Mr. Harbison—What will the machine weigh?

Capt. Ross—The discharger will weigh 8½ tons, and the charger about 7 tons.

Mr. Scriver—Are the chargers and drawers suitable for through retorts? Our retorts are of that description, 20 feet long.

Capt. Ross—Yes. That would necessitate a 10 ft. stroke.

On motion of Mr. White, a vote of thanks was tendered to Capt. Ross for his paper.

Report of Committee on Nominations.

The President—Is the Committee on Nominations ready to report?

Mr. Stiness—I am instructed by the Committee on Nominations to make the following unanimous report. Before I read the name which has been decided upon for President of this Association, I may perhaps be pardoned at an expression of the pride which is natural and inborn to me. Within a few years the State which I represent has been honored by this Association, and one who occupied the position which you now fill, Mr. President, equally honored the Association. I name to-day for President of this American Association of Gas Engineers, one who has been to me for more than a quarter of a century, a friend and a brother. I give to you the name of Alpheus B. Slater, of Providence, Rhode Island, as the nominee for the office of President. (Applause.)

For Vice-Presidents—Emerson McMillin, Columbus, Ohio; John P. Harbison, Hartford, Conn.; William Henry White, New York.

For Secretary and Treasurer—C. J. R. Humphreys, Lawrence, Mass.

By the amended Constitution we were directed to bring in the names of eight active members as nominees for the Council. As four members of the Council are to retire annually, it will be necessary to elect at this meeting four members for the term of two years, and four others for one year. We therefore give you for the long term the names of—

For Two Years.

W. H. Pearson, Toronto, Canada. Chas. W. Blodget, Brooklyn, N. Y.
G. G. Ramsdell, Vincennes, Ind. A. E. Boardman, Macon, Ga.

For One Year.

Matt. Cartwright, Rochester, N.Y. Thomas Curley, Wilmington, Del.
B. E. Chollar, Topeka, Kansas. Wm. H. Baxter, Petersburgh, Va.

Election of Officers.

Mr. Stiness—I move that the Chair appoint a committee of one to cast a ballot of the Association for the election of the nominees.

The motion prevailed; the President appointed A. C. Humphreys as such committee. The ballot was cast accordingly, and the nominees were declared duly elected officers of the Association for the ensuing year.

The President appointed Mr. White and Mr. Harbison a committee to present the newly elected President.

Mr. White—Mr. President, I have pleasure in presenting to you Mr. A. B. Slater, the President-elect of this Association.

The President—Gentlemen, I take great pleasure in presenting to you Mr. Alpheus B. Slater, of Providence, R. I., as your President for the ensuing year.

Response of the President-Elect.

Mr. Slater—Gentlemen of the Association, for the distinguished honor you have conferred upon me in electing me to this office you have my grateful appreciation. Remembering whom my predecessors have been, I can but have a realizing sense of what you have a right to expect from me. It is fortunate, perhaps, that the success of this Association does not depend upon the President alone, but upon the united efforts of individual members. I class myself with the workers rather than with the talkers; and whatever I can do to promote the interests and the welfare of the Association I shall endeavor to do to the best of my ability. (Applause.)

Report of Committee on Membership Applications.

The President—Is the Committee on applications for membership ready to make a report?

Mr. Ramsdell—The Committee beg leave to report as follows: We find, because of the adoption of the new Constitution, there is some conflict in the election of associate members, and we ask for instructions from the Aseociation as to our duties. According to the new Constitution which has been adopted, it will be necessary that applications for membership be received ten days before being acted upon. It says:

"Application for Active Membership, or for Associate Membership, or for transfer from Associate to Active Membership, must be received by the Secretary at least ten days prior to the meeting at which the application is acted on."

Mr. Stiness—As we have just adopted a new Constitution I hope that we shall live up to it. I take a little pride to-day, as being one of the movers in the matter of the forming of a new Constitution for this Association. The new Constitution may prove in course of time to have defects; but as it is, let us stand by it. The thought that actuated me in my efforts to secure amendments to the old Constitution, was that in an Association of this character there should not be the hasty action which was taken at the Philadelphia meeting in making members of this Association—not, as you well know, that I had the least objection to any one of them; but I did object to the rushing of the names through in the way it was done there, and without the consideration which is due to the Association, and to that class of membership. As we have adopted a new Constitution, I for one do most earnestly hope that its provisions will be strictly adhered to. I hope no amendments to it will be offered before the ink is hardly dry upon the document. I do hope that we will conform to the Constitution, to-day and hereafter.

Mr. White—I move that the matter be referred again to the Committee, with instructions to report these names for ballot. I make that motion for this reason. When that Constitution was presented in the Executive Committee night before last, and discussed, its bearing upon this very subject was one of the topics of discussion; and it was unanimously agreed there that it should have no effect upon gentlemen who are present at this time and soliciting membership here. That after the adoption of this Constitution, at subsequent meetings members should be divided into the new classes of active and associate members; but that anybody present at this meeting, coming here under the old Constitution, and coming here with the expectation of joining this Association, should not be debarred from that privilege. It will be a great mistake to enforce that provision of the new Constitution at this meeting. While this Association has the right to adopt this new Constitution, it has no right to pass any *ex post facto* law of that kind. It is not good judgment. It is not good taste. It is not courteous to those gentlemen who have applied for membership at this meeting. I stated yesterday, in presenting the Constitution, and as the expression of opinion upon the part of your Executive Committee, that the gentlemen who at this meeting presented applications should be treated just the same as at past meetings, except that those gentlemen should be divided into the two new classes. I, therefore, press my motion for the consideration of this body, that these names be again submitted to your committee with instructions to the committee to report upon them favorably.

Mr. McMillin—I had risen to say about what Captain White has said, and he said it so much better than I could that I am glad he got the floor. It was the understanding of the Executive Committee that the

adoption of the new Constitution should not interfere with the presentation of names at this meeting. It was so understood yesterday, I think, when the Constitution was adopted; and it was certainly violated yesterday. We voted in members yesterday, and in that way the Constitution was violated, and the precedent was established. It would be impossible for gentlemen who came here expecting to be made members to know that they would have to present their names ten days before hand; and I think it would be decidedly unfair to have them wait for another year. No harm can be done by admitting them now. The Committee will examine the names with the greatest care. We all know that Mr. Ramsdell always attends to his work very carefully. I am also a member of the Committee, and I am sure that no harm can be done by following the precedent established yesterday; whereas great injustice may be done by ignoring the rule as it was understood in the Executive Committee, and as it was understood when the Constitution was adopted, and as was practiced yesterday after the Constitution was adopted.

Mr. Harbison—I heartily advocate the view taken by Captain White. It was the distinct understanding before adoption of the Constitution yesterday, and was so distinctly stated in respect to the question bearing upon that particular point, that the new Constitution should not apply to applicants for membership at this meeting. But there it should end. At the adjournment of this meeting the provisions of the new Constitution will come into force; but as to those who applied for membership at this meeting the ten days' provision should not apply, but that they should have the right to come in and be divided among the two classes of members.

Mr. Clark—I would like to inquire under what clause of the Constitution under which we are now acting this Association has any right to appoint a committee to examine the names of applicants. Hereafter such applications will come into the hands of the Council, and without a violation of the Constitution the President cannot appoint a committee, nor can the Association, even by unanimous consent, instruct the committee to return any names. If we open the door to a violation of the provisions of the Constitution we do not know where it will end. If there is any good in the Constitution it should be lived up to to the very letter.

Mr. A. C. Humphreys—I think it does not concern this meeting to learn what the agreement was in the Executive Committee. The Executive Committee were privileged to come in here and make arrangements which would carry out their ideas; if they failed to do so we have nothing to do with it, so far as I can see. The Constitution has been adopted, and we should be governed by it. If the Executive Committee had brought in a provision making it take effect immediately upon the adjournment of this meeting of the Association, that would have been proper enough; but as they failed to do so, I think that we should carry out the Constitution just as it has been adopted.

Mr. Harbison—I will suggest that it has been strictly adhered to, in that it was verbally stated that the Constitution was to take effect at the close of this meeting.

Mr. McMillin—Except as to making the two classes of members.

Mr. Harbison—Yes; that was distinctly stated as one of the provisions—not in the printed Constitution, but verbally. Further, in reply to the suggestion that the President has no right to appoint the committee under the Constitution, I beg leave to differ. A committee was appointed by the President before the new Constitution was adopted. The committee is still in session, and has made a partial report; and now comes in with an additional one.

Mr. White—In reply to Mr. Humphreys I would say it was very distinctly stated what were the wishes or views of the Executive Committee on this subject, and the Association then showed its appreciation of that fact by adopting unanimously the report of the Executive Committee, and by proceeding immediately to take the very action we now ask for. The Association did elect three or four gentlemen here yesterday, who had not given the ten days' notice required by the new Constitution; and I say it is an outrage upon the gentlemen who have paid out their money to come here with the expectation of being made members of this Association. It is all a farce to talk about this matter as being a precedent which would open the doors hereafter to all applicants. It is a matter which has been thoroughly well discussed here. It is a matter of courtesy that we cannot fail to extend to these gentlemen without stultifying ourselves.

Mr. Humphreys—I think if the record is searched you will find that the intimation referred to by Mr. Harbison and Mr. White was that we were to act upon those three names that were offered as associate members; that the action on those was delayed on account of not being able to act upon them under the old Constitution, because under that there were no associate members. It was distinctly stated that this action referred to those three applications. I think if the record is searched you will fail to find there was any intimation that the law was to be broken afterward. Of course the committee was appointed before that action, because there was no Council then to act upon the applications. We were still acting under the old Constitution when the committee on membership was appointed; but the moment that Constitution went into effect that committee was discharged.

Mr. Harbison—The report of the Executive Committee was twofold—part verbal and part printed. The verbal part was that the action of the Committee should not affect the applications which might be received at this meeting, except so far as classification was concerned. The printed report also classified the applicants. The entire report was adopted by the Association—the verbal portion as well as the printed; the verbal portion being that it would not apply to applications received at this meeting except as to classification. That was adopted in conjunction with the printed report making the classification. So that in strict parliamentary law you cannot shut out these applicants, if they are eligible, because you adopted the report of the Committee, which was twofold.

Mr. Clark—I will ask if in strict parliamentary law any man who is elected to his office outside of the Constitution is legally entitled to that office or is legally a member? It is not so held in State, municipal or national elections. I think any man who is now elected outside of that Constitution is not a member of the Association. There is no objection to any man who has applied for admission; and they would have been reported favorably upon and immediately if the Constitution had not stood in the way. But as it is, if I know anything of parliamentary law, we cannot now elect those members. We have a Constitution, and whatever the verbal arrangement or understanding of the Executive Committee may have been, we have nothing to do with it. This Association now stands upon this printed Constitution which it has adopted.

Mr. White—I maintain that the Constitution is practically not in effect until after the adjournment of this meeting. The officers elected under that Constitution do not take office until after we have adjourned; and the general understanding was, in the discussion of that subject, that the Constitution did not go into effect, and did not practically affect this meeting, except that we all agreed that the classification of members therein provided for should take effect as quickly as possible. It seems to me that our quibbling on technicalities will belittle us considerably, and will amount to nothing as a protection of this Association. This Association is big enough and ugly enough to take care of itself.

The President—You have heard the motion as offered by Mr. White. It is that the applications of these gentlemen be referred back to the committee, with instructions to report at this meeting. Are you ready for the question?

The motion prevailed.

Mr. Jas. D. Perkins, of New York city, read his paper on—

GAS COALS, WITH SPECIAL REFERENCE TO PROVINCIAL COAL.

Mr. President and Gentlemen of the American Gas Light Association:—The invitation of your Committee to submit a paper to the Association at the present session was not only unsolicited but entirely unexpected. The subject assigned to me was one with which I have been somewhat familiar for nearly 40 years, although I can hardly expect to add anything to the general fund of information already in the possession of the members of the Association.

The subject assigned to me by your Committee was, "Gas Coals, with Special Reference to Provincial Coal." I shall make no attempt to separate the special from the general subject, as during a large part of the time to which reference will be made the two have been so closely interwoven as to render such division impracticable.

For a period of nearly 60 years prior to 1880, Provincial coals occupied a most important relation to the gas industry of the United States; and a brief sketch of their early history may find appropriate record within the limits of this paper, and not prove entirely uninteresting to the members of the Association.

It is a matter worthy of note that the first recorded mention of the existence of coal in North America had reference to the coal deposits of Cape Breton. This occurs in a French work published in 1672 by one Nicholas Denys, who was appointed Governor of that Island by Louis XIV., in 1637. In 1654 he secured from the French government a concession to "search for and work all mineral deposits of the Island." By virtue of this grant he made some trial shipments of coal to France, where it was highly esteemed; but Denys was more interested in fishing than in coal mining, and when his patent was revoked, in 1690, no organized effort had been made to develop these valuable deposits.

Following the above in chronological order appears the first record of

the existence of coal within the present limits of the United States. This occurs in a report made by Father Hennepin, the Jesuit, in 1698, wherein he speaks of coal deposits on the Illinois River, near what is now Peoria.

Returning to Provincial coal, the first attempt at regular mining in Cape Breton was made in 1720, when the celebrated Fortress at Louisburg was constructed by the French Government. The fuel necessary for the large force employed in this work was obtained from a coal seam on the north side of Cow Bay. A considerable trade had sprung up about this time between Cape Breton and New England, and in 1724 mention is made of a vessel having "*loaded coal at Cow Bay for Boston.*" The records are silent as to further shipments down to 1745, when the Island passed into the hands of the English, who held it for four years, when the French again came into possession. From this time forward until the reduction of Louisburg by the English in 1758, the mining of coal at Cow Bay appears to have been limited to the wants of the forts at Louisburg and Halifax; but between 1763 and 1767 applications for leases to work the Cape Breton coal mines were made to the British Government. These applications met the approval of the Governor of Nova Scotia, under whose directions an accurate survey of the island was made in 1766. In his letter to the Home Government the Governor refers to the *only coal mine then open;* viz., that on the north side of Cow Bay, where there was a block-house located upon the site of what has since been known as the *Block House Mine.*

It was about this time that further evidence of the existence of coal in the United States was furnished by Colonel Cregan, a prisoner in the hands of the Indians in 1763. The coal was located on the banks of the Wabash, in Indiana. This was followed in 1770 by the discovery of coal in Western Pennsylvania.

In April, 1767, in accordance with the recommendation of the Governor of Nova Scotia referred to above, a coal-mining lease was granted to certain Halifax merchants, under which they guaranteed to produce and ship not less than 3,000 chaldrons of coal within eight months. This undertaking they failed to carry out, their shipments within the time specified amounting to not quite 2,300 chaldrons.

It is interesting to note the points to which a portion of this coal was sent, as bearing upon the operations of the Cape Breton collieries in later years, and also to contrast the capacity of the vessels employed in its transportation with those of the present day.

Of the 2,300 chaldrons named, there were shipped to New York 60 tons; Providence, 54 tons; Boston, 44 tons; Philadelphia, 45 tons.

From this time forward, until 1826, continued attempts were made to extend the operations of the Cape Breton collieries, alternately by lease to private parties, and by Government itself, but with apparently little profit to either. Lack of facilities for preparing the coal properly for market, and the uncertain tenure of the leases under which some of these efforts were made, were the main obstacles in the way of success. The quantity mined in any one year prior to 1826 does not appear to have exceeded 10,000 chaldrons, while the average for the 40 years preceding that date was but little over 7,000 tons. Such was the condition of the Provincial coal trade in 1826, and a more discouraging one could scarcely be imagined.

In the exercise of his royal prerogative, and in one of those freaks of liberality which characterized royalty at that time, George IV. had granted to his impecunious brother, the Duke of York, a lease of all the mines and minerals of Nova Scotia (the Island of Cape Breton having been annexed to Nova Scotia in 1820), with certain exceptions, for a term of 60 years. This grant was dated August 26, 1826. As the Duke of York had no means of working the mines on his own account, even if he had possessed the ability, he transferred the lease in 1827 to a company, which had then recently been organized in London under the name of "The General Mining Association," and in 1828 this association secured the control of the Albion Mines in Pictou, which, up to that time, had been held by private parties, and not covered by the royal grant. This gave to the association the exclusive working of all the mineral properties in Nova Scotia and Cape Breton belonging to the Crown. The efforts of the management of the association were directed mainly towards placing upon the market such coals as were best adapted to domestic and general steam purposes. Anthracite coal had only recently come into the market, and there was a large demand for bituminous coal of such a character as the association could supply; hence the rapid increase in the sale of Sydney coal in the New England States, and for many years this coal enjoyed the highest reputation for house use in open grates as well as for steam purposes. But as the present paper has reference to *gas coals* mainly, I turn to the consideration of that portion of the business of the association specially connected with such coals.*

*For the historical facts given above I am indebted to the admirable work entitled, "The Coal Fields and Coal Trade of Cape Breton," by Richard Brown, Esq., published in 1871.

At the period referred to (about 1830) the gas industry of the United States was in its infancy; it had scarcely assumed the proportions of a distinctive feature in the manufacturing enterprises of the times. The requirements for coal were insignificant, and no special efforts were made to meet them. Newcastle coal was the standard gas coal in England, and formed the larger part of the supplies of the gas companies then in operation in New York and New England.

Some idea of the limited character of the business may be gathered from the following item which I quote from the Boston Almanac of 1837. Speaking of the city gas works, it says: "The gas made at this establishment is a compound of coal and resin, and is esteemed for its brilliancy and illuminating power. There are three gasometers connected with the company's works—two in Hull street, each 40 feet in diameter, and one in Washington street, at the extreme south part of the city, of 80 feet. This is the largest gasometer in the United States, and contains 15,000 cubic feet of gas. The roof over this building spans 102 feet, and rests entirely upon the walls, without any support in the center."

I venture the assertion that no better illustration of the progress of gas manufacture during the past fifty years can be presented than is found in comparing this description of the Boston gas works in 1837 with the present complete and perfectly appointed establishment of that company, representing every department of modern improvement in the science of coal gas manufacture, embodying the results of nearly forty years of the personal experience of its present executive head.

Enquiry as to the description of coal referred to in the above extract leads to the conclusion, that it was from the Albion mines, Pictou, as it was supplied by Mr. Samuel Cunard, who represented the General Mining Association at that time.

The only gas coals available to the General Mining Association were those from the Albion Mines at Pictou, and the Lingan Mines in Cape Breton; as the latter was not operated until 1855, the Albion was the only Provincial gas coal obtainable prior to that date.

The records of the association give the annual shipments of this coal to the States; but, as a large percentage of the quantity reported was used for iron manufacture and foundry purposes, it is difficult to form any reliable estimate of that which entered into the manufacture of gas. It was used in the Boston works in 1838, and no doubt continued to form a part of their supplies from that time forward until 1875, when its use by that company was abandoned.

My own personal recollection of this coal dates back to 1845, when the house with which I was connected commenced the importation and sale of this coal. The facilities for the conduct of the business at that time were extremely limited; navigation was only possible between May and December, the straits of Canso being closed by ice during the remainder of the year; the vessels employed in carrying the coal were small, varying from 80 to 120 tons capacity, and mainly owned by the maritime interests of the Province. While these benefits were generally acknowledged and appreciated, there had been gradually developed a feeling of dissatisfaction that such important interests were restricted to one company.

It was felt that the continued existence of such a monopoly was an obstacle in the way of a larger development of the immense mineral resources of the Province. The management of the association realized the importance of meeting the situation thus presented to them, and negotiations were commenced in 1855 looking to some modification of the lease under which they had for nearly 30 years been working.

In 1858 an agreement was entered into with the Colonial Government by which the lease of 1828 was abrogated. The association was confirmed in the possession of the collieries which it was then operating, with the exclusive right to further territory adjacent thereto, and an additional consideration in a material reduction of the royalties which had hitherto been paid by them.

This arrangement threw open at once to private enterprise a large area of mineral property which otherwise must have remained for many years undeveloped. The local government at once received numerous applications for leases to work some of the most promising of these deposits, and it was under the management of the parties receiving these grants that some of the most successful collieries in the Province have been conducted. These new enterprises had scarcely been placed in working condition when the events of 1861, suspending for several years the operations of some of the larger collieries in the States, gave to the Provincial coal trade an impetus which called for the exercise of all the resources at the command of its managers. From 1861 down to 1870 it was not so much a question of price as it was of ability of the companies to meet the pressing demands for coal—not alone from gas companies, but for general steam and manufacturing purposes.

In addition to the Albion and Lingan Collieries, to which reference

has already been made, there were five collieries in the Provinces opened up by private enterprise, from which the gas companies in the States drew a large part of their supplies during the twelve years named.

A brief sketch of the organization of these collieries, and of their operations during this period may not be entirely without interest. I shall refer to these new enterprises in the order in which the applications were granted. Commencing with the lease for the working of the

Little Glace Bay Mines, Little Glace Bay, C. B.

This was given to Mr. E. P. Archbold in 1858. A company was formed in 1861, and a harbor constructed giving excellent facilities for loading vessels of the largest class.

Block House Mines, Cow Bay. C. B.—Lease granted to Marshal Bourinot in 1859. Operations commenced in 1860 upon the site from which coal had been mined in 1766, nearly one hundred years previous.

Gowrie Mines, Cow Bay, C. B.—Lease granted to Messrs. Archibald & Co., 1861.

Caledonia Mines, Port Caledonia, C. B.—Mining operations commenced in 1865, under the management of Messrs. J. H. Converse, Estes Howe, and others of Massachusetts; but shipments were delayed until 1868, when the present harbor at Port Caledonia was completed, and a railway constructed to connect with the colliery.

International Mines, Bridgeport, C. B.—Leases for the working of these mines were granted in 1858. There being no suitable harbor for the loading of vessels, the first shipments of coal were lightered to vessels at anchor in the open bay. The mine was transferred to a New York company in 1863, when arrangements were made to connect the colliery with Sydney by rail; but this project was not carried out until 1870. The delay in the completion of this work prevented the company from availing of the active demand for coal in the States up to that time.

The coal from the Glace Bay and Block House Mines came into the market at a time when the demand for gas coal was very active. No difficulty was experienced in finding sale for all these collieries could then produce. *The Glace Bay* was distributed among the leading gas companies between Portland, Maine, and Washington, D. C., the capital being lighted by gas from that coal in 1863. It was also used at Fortress Monroe while General Butler was in command at that station. The Northern Liberties Gas Company, Philadelphia, purchased a large part of their supplies from Glace Bay during the war and immediately thereafter. The price during the early years of its operations was $2.40 gold per ton 2,240 lbs. f. o. b. vessel at the mines; and in 1863 the company sold its entire product at the opening of the season at that price. This coal was a favorite one with the New York companies, and shared the trade in that market in nearly equal proportion with the Block House, supplying at the same time a larger part of the gas coals required in New England.

Block House.—In spite of the difficulties attending the loading of vessels at Cow Bay, owing to the exposed condition of the harbor, this colliery enjoyed a most prosperous trade with the States from 1861 down to 1873; the bulk of its product went to New York, where it easily commanded $2.60 gold per ton f. o. b. vessel during the early years of its operations.

About 1880 indications of an early exhaustion of the mine were apparent, and from that time forward, the bulk of the coal shipped was obtained from the pillars. This work was completed in 1885, when the mine was abandoned.

The Caledonian Mines, which went into active operation in 1868, were managed by gentlemen who had been largely interested in the Glace Bay Colliery, and a somewhat sharp competition sprung up between the two interests for the United States trade, and in the active demand for coal following the opening of the colliery, it succeeded in getting a strong footing in the market. It reached a maximum output of over 75,000 tons in 1873. From that date forward it shared in the general decline of all Cape Breton coals; its export in 1874 being less than one-half of that of the previous year, and again in 1875 falling off to 16,000 tons. The larger part of the product of this colliery in its most prosperous days was sent to New York. When the competition for the gas coal trade became the sharpest, this coal was one of the first to yield to the pressure, its quality for that purpose not being considered equal to the Block-House or little Glace Bay. It can hardly be rated in the catalogue of gas coals at the present time.

International.—As noted above, this coal did not come on the market to any extent until 1870. It found temporary foothold in the New York market during the three years following, over 100,000 tons having been disposed of there for gas purposes. Various causes, partly incident to the management and in part to the value of the coal, as compared with other Provincial coals, led to its early abandonment by the gas companies in the States, and its operations subsequent to 1873 were upon a very limited scale. In 1877 financial difficulties led to a sale of the property. Since that date the colliery has been successfully worked by the new management, finding sale for its product mainly in the Provincial market.

The Gowrie coal came into the market as a gas coal, and found limited sale for that purpose in the early days of its operations. The peculiar character of this coal did not warrant its being screened at point of shipment, and the condition in which it came to market soon led to its abandonment for gas purposes.

The proper limit of this paper has not warranted a more detailed sketch than is here presented of the important part which the Provincial gas coals assumed in the United States market down to 1880. A large degree of their prosperity was no doubt due to the existence of the Reciprocity Treaty, which continued in force until 1867, giving these coals free admission into the States for over five years. The abrogation of that Treaty in 1866 subjected Provincial coals to a duty of $1.25 per ton, payable in gold, which was still held at a premium. The effect of this tax was seen in a decrease of importations in 1868, of nearly 100,000 tons, or about twenty per cent. less than the previous year. I have annexed a table showing the shipments of Provincial coal to the States from 1850 down to 1886, inclusive; the quantities named therein include shipment for other purposes as well as for gas, but the changes indicated from year to year may be taken to fairly represent fluctuations in the gas coal trade for those years. I also append a table showing comparative results obtained from the best-known American and Provincial gas coals. This table was prepared from the records of a leading gas company, in whose works both descriptions of coal had been largely used prior to 1876.

I have not attempted to give the cost of these coals in detail at the points of consumption during the period of their most active sales. The purchaser paid for the coal in gold at the mines, and assumed all the additional items entering into its transportation to the point where it was required; the fluctuations in the premium on gold varying at times from 5 to 20 per cent. in one day, and from 20 to 50 per cent. during the year, renders it impracticable to give any reliable quotations for these coals in the States prior to the resumption of specie payments. Sales were occasionally made in 1865 at $14 U. S. currency per ton delivered in New York, and these figures no doubt represent the maximum cost of any of the Cape Breton coals in the States at any one time; this item represented say $2.50 gold per ton for the cost of the coal at the mines, and a vessel freight varying from $6 to $8 per ton U. S. currency. These high freights were caused partly by the heavy demand for tonnage necessary for the delivery of the large quantities of Provincial coal required during the war and the few years subsequent thereto. A large per cent. of the vessels employed were under the American flag, necessitating extra marine insurance to cover the war risks attending such voyages. So heavy was the strain upon the capacity of the colleries during that period, that it was no uncommon event for vessels to wait four or five weeks for their turn to load; this delay in securing cargo had much to do with the high freight demanded at that time. The close of the war and the removal of the disabilities which had during that time rested upon American vessels, the opening up of other sources of coal supplies and consequent decrease in the demand for Provincial coal, caused a gradual decline in these freights, reaching a nominal rate of $1.75 during the later years of the importation of these coals.

Albertite—Any presentation of the subject of Provincial gas coals which did not include some consideration of the celebrated Albertite of New Brunswick would necessarily be incomplete.

For a period of nearly thirty years from 1852 down to 1881 this mineral stood at the head of all the then known materials for the enrichment of coal gas. Immediately upon the discovery of this valuable deposit a company was organized to develop it, and the first shipments were made to the States in 1852. As the lease of the General Mining Association covered all the mineral deposits in the Provinces, its managers at once laid claim to the property. This claim was resisted upon the ground that the article was not a mineral, and therefore not covered by the Association lease. Protracted litigation ensued, involving the testimony of some of the most expert scientists in the States and Canada. These gentlemen differed materially as to the true name of the deposit and of its geological formation. Professor Dawson, in his admirable work on Acadian Geology, thus comments upon these divergences of opinion: "This was not wonderful in the circumstances; for the substance was really a new material, intermediate between the most bituminous coals and the asphalts, and the geologists examined had enjoyed very few opportunites of studying that very remarkable group of rocks to which the deposit belongs. Consequently some in all sincerity called the material 'coal,' others 'asphalt.'"

The same eminent writer thus describes the appearance of this material, which he characterizes as "asphaltite mineral:"—

"The substance has externally an appearance not dissimilar from ordinary asphalt of commerce in its purest forms; but it is very much less fusible, and differs in chemical composition. Its lustre resinous, and splendent or shining. Its color and the powder and streak on porcelain, black; and it is perfectly opaque. It is very brittle and disposed to fly into fragments. It emits a bituminous odor, and when rubbed becomes electric. In the flame of a spirit-lamp it intumesces and emits jets of gas, but does not melt like asphalt."

The decision as to the ownership of this valuable deposit was adverse to the claim of the General Mining Association, and the rights of the company originally in power were confirmed.

The earlier shipments of this mineral were used in the gas works at Boston and New York; but upon the introduction of kerosene oil manufactured from shale and cannel coal a large portion of the product of this mineral was devoted to that purpose. The discovery of petroleum in 1859, however, put an end to the distillation of oil from cannel and similar material, and albertite took its place for many years as an enricher of coal gas. Its use in later years was almost entirely confined to the Boston gas works; the limited production only allowed an occasional cargo to be placed in other markets.

Its value for gas purposes had been variously estimated at $22 to $25 per ton. The deposit was exhausted in 1881, and all attempts to locate other deposits of a similar character have so far been unsuccessful.

It is scarcely probable that Provincial gas coals will ever regain the position occupied by them during their most prosperous years. Their geographical position places them at a great disadvantage, even under the most favorable circumstances, when competing with American coals; being restricted to about seven months in the year, during which vessels can be secured at favorable freights, and it is at this period that the requirements of gas companies are the lightest.

Neither party to a contract for any large quantity of these coals for delivery in the States would be justified in estimating the cost of such delivery, say at New York, under $4 per ton of 2,240 lbs. This estimate is based upon the following figures:

Cost of the best screened gas coals f. o. b. vessel at shipping point,	$1 50
Average freight on same from *May* to *November*	1 75
Duty under present tariff	75
	$4 00

which is the contract price for the best American gas coals for the present year, covering continuous delivery in New York through the entire season from April to April.

American Gas Coals.

The records of the early gas companies in the States do not indicate clearly the period when the American coals were first used in the manufacture of gas, or from what particular mines they were received. It is well known that illuminating gas has been made from various materials before coal came into use. As early as 1802, the city of Richmond, Va., had been lighted by gas from wood. Whale oil was first used about 1825, in the New York works, to be substituted for resin soon after; and the latter article found a place in all the older gas works down to 1850, being used not only alone, but also as an enricher for coal gas. In the early days of the Baltimore works, which were incorporated in 1817, resin and foreign coals were used, and it was in these works without doubt that American gas coals were first used. It came from the Midlothian region near Richmond, Va. The date of its introduction is not stated, and it was probably the coal later known as Clover Hill.

Coal was first used in the gas works in Philadelphia in 1836. This was domestic coal from the Pittsburgh region, and was no doubt of the same general character as that now procured from that region.

Resin and foreign coals were the materials used in the early days of the Manhattan gas works of New York in 1835 and 1837. American coal first appeared upon their records in 1850, under the general name of Virginia coal; this was without doubt the Midlothian coal, which had been in use for some time in the Baltimore works. In 1855 the so-called West Virginia coal came into the market, the first shipment being from the Newburg Orrel Mine to the Baltimore works. This coal and others of a similar character from the same region formed a large part of the gas coal supplies in the New York market down to 1861, when operations were interrupted, not to be resumed until after the close of the war. In the meantime the rapid development of the gas coal mines in Western Pennsylvania had been going on, and when the West Virginia coals were again available the market, which they had formerly controlled to a large extent, had been secured by the various Pennsylvania companies.

The operations of these gas coal companies from 1865 down to the present time, with the extension of the Baltimore and Ohio R. R. into the Youghiogheny coal district, opening up the valuable gas coal of that region to the market on the Atlantic seaboard, and more recently the development of the gas coal deposit on the line of the Chesapeake & Ohio R. R. are events all familiar to the members of this Association, and do not call for comment from me at this time.

I desire, Mr. President, to express to you, and through you to the gentlemen of the Association, my appreciation of the courtesy extended to me by your committee in the invitation to address you on this occasion, and to thank the members present for their patient attention to what I have had to say.

Provincial Coal Exported to the United States.

Years.	Tons.	Duty.	Years.	Tons.	Duty.
1850	118,173	24 ad.	1869	257,485	$1 25
1851	116,274	"	1870	168,180	1 25
1852	87,542	"	1871	165,431	1 25
1853	120,764	"	1872	154,092	75
1854	139,125	Free	1873	264,760	75
1855	103,222	"	1874	138,335	75
1856	126,152	"	1875	89,746	75
1857	123,335	"	1876	71,634	75
1858	186,743	"	1877	118,216	75
1859	122,720	"	1878	88,495	75
1860	149,289	"	1879	51,641	75
1861	204,457	"	1880	123,423	75
1862	192,612	"	1881	113,728	75
1863	282,775	"	1882	99,302	75
1864	347,594	"	1883	102,755	75
1865	465,194	"	1884	64,515	75
1866	404,252	"	1885	34,483	75
1867	338,492	$1 25	1886	60,646	75
1868	228,132	1 25			

* The above table is from the "Report of the Department of Mines, Nova Scotia, for the year 1886."

Name and location of mine.	Gas. Feet per Ton, 2240 Standard.	Gas. Maximum yield per ton of 2240.	Gas. Candle Power.	Gas. Specific Gravity. Air 1000.	Coke. Bushels of Coke per Ton of 2,240 Coal.	Coke. Pounds of Coke per ton of Coal.	Coke. Specific Gravity of Coal.	Analysis of Coal. Per cent. of Volatile Matter.	Per cent. of Fixed Carbon.	Per cent. of Ash.	Per cent. of Sulphur.	Per cent. of Water.
Average result obtained from the Standard American Gas Coals from Western Pennsylvania, viz.: - - - - Westmoreland, Penn., and Youghiogheny.	9500	11800	16.50	0.450	42	1600	1300	33.80	56.99	6.52	1.19	1.50
Average result obtained from the leading Cape Breton Gas Coals, viz.: - - Block House, Glace Bay, Caledonia.	9500	10800	15.60	0.447	34	1570	1285	35.25	53.18	5.50	3.01	3.06

The coke produced from the American gas coals herein named is a most excellent article for house and general use, but *not so strong* for use *under the retort* as that obtained from the Cape Breton coals, or from some of the *sulphurous* gas coals obtained from Western Virginia. Those gas companies whose facilities for *purifying are ample* prefer to have from *one-fourth to one-third* of their coal from either Cape Breton or Western Virginia, in order to get a *stronger* coke than the standard Pennsylvania coals afford.

It will be noticed that the *American coals* produce 20 *per cent. more coke* than the Provincial coals—a very important item when it is considered that from 50 *per cent.* to 60 *per cent.* of the coke made is *sold by the bushel* for house use.

Sulphur.—One bushel of hydrate of lime will purify about 5,000 cubic feet of gas made from American coal, and about 2,500 cubic feet of gas made from Provincial coal.

On motion of Mr. Page, a vote on thanks was passed to Mr. Perkins.

The President announced that as the hour for adjournment had arrived, the discussion on the paper would be postponed until the afternoon session.

Report of Committee on Applications for Membership.

Mr. Ramsdell—In behalf of the committee on applications, I make a favorable report upon the names of William R. Higby, W. H. Pearson, Jr., A. B. Slater, Jr., Charles H. Stoddard, Mark B. Thomas, H. J. Bell and H. J. Chadwick for Active Members; and H. A. Norton, Peter G. Van Wie and W. S. Wright for Associate Members.

Mr. Harbison—I move that the report of the committee be accepted, and that the chairman of the committee cast the ballot of the Association for the election of the applicants named.

The motion prevailed.

Mr. Ramsdell—Hearing no objection to the names read, I cast the ballot of the Association for their election as members in accordance with the instructions.

Mr. Harbison—I want to offer a resolution at this time, if the Association will bear with me. Before offering it I will give a word of explanation as to why I offer it. In reporting the Constitution yesterday, and in our action upon it, there is in the minds of some gentlemen an opinion, to which they are well entitled—for I have no question about its honesty—that we were not acting yesterday in a strictly parliamentary way in the election of these gentlemen as members, after the Constitution was adopted, and to-day; on the other hand, those of us who have advocated their election are equally conscientious in our position. I think I see a way in which all can come to the same conclusion—doing no injustice to the gentlemen who have been elected, and at the same time doing credit to ourselves by doing business in a strictly orderly manner. I, therefore, desire to offer this resolution for the purpose of clearing away whatever mist there may be with respect to this matter:

"*Resolved*, That the Council of this Association be, and they are hereby instructed to report the names of gentlemen who were elected on the 17th and 18th of October, 1888, as members of this Association, after the adoption of the Constitution, for election at the next annual meeting of this Association to be holden in the city of Baltimore, Maryland."

If we adopt that resolution the gentlemen whom we elected yesterday, and those who have been elected to-day, will in honor consider themselves, and the members of this Association will consider them as brothers and members of the Association, having had the honor of an election by unanimous vote of the Association. By instructing our Council to report their names for election we put ourselves again on record under the Constitution as favoring their election at the next annual meeting, which will be done in a strictly constitutional way, as they will then come in under the ten days'

provision of the Constitution. This proposed vote meets the hearty approval of one of the gentlemen who earnestly and conscientiously opposed our action in this matter, and who has served as a member of the committee on applications; and I trust that it will meet the concurrence and approval of the gentlemen who were as conscientious as he is in opposing our action. I think that the passage of the resolution which I now offer will clear away all the mist that surrounds the whole matter; and I, therefore, ask for a vote of the Association upon the resolution.

Mr. Stiness—I would like to ask one question of my brother Harbison: Are not these gentlemen already, at this moment, according to the general understanding of this Association, members of this body?

Mr. Harbison—Yes, I believe they are members according to the understanding, but according to the interpretation of the Constitution which others put upon it they are not, and it is to harmonize the views of the entire Association, and so to prevent the possibility of this question coming up again, and also to prevent our action on this occasion being cited as a precedent in future cases as a waiver of the ten days' provision of the Constitution, that I offer this resolution.

Mr. Stiness—I have no objection to the adoption of the resolution. The point that I raised was whether there was any general understanding among all the members of the Association that all the names presented at this meeting would be considered as properly presented, or only those that were presented yesterday before the adoption of the Constitution. Had I understood as clearly as I believe some other gentlemen of the Association did understand, that all the names presented at this meeting were to come in under that general head, I would have acquiesced in it. But I did not so understand it. I do not think that this resolution can do any harm, and I do not really see that it is going to do away with any precedent that has been already established. It is like a good many other things—it don't do much good, and cannot do much harm.

Mr. Harbison—After the adoption of this resolution there will be no question, at the meeting of next year, as to the right of these gentlemen to be considered by everybody as members of this Association, in equal standing with every other member; whereas now their standing is in doubt in the minds of some of the gentlemen in this room.

Mr. Stiness—If there were a preamble put to that resolution, that whereas certain names having been presented under a misapprehension, or a misunderstanding of the Constitution, it then would explain why the resolution was presented.

Mr. Harbison—I will accept the suggestion as to a preamble.

Mr. A. C. Humphreys—I would like to ask Mr. Harbison under which Constitution these gentlemen were elected associate members?

Mr. Harbison—They were elected as associate members under the provisions of the new Constitution, as the old Constitution did not provide for them, and I think that the gentlemen who voted for them did so with that understanding.

The President—Are you ready for the question on the resolution offered by Mr. Harbison, with the preamble suggested by Mr. Stiness?

Mr. Harbison amended the resolution so as to read as follows:

"*Whereas*, There is doubt in the minds of some of the members as to the legality of the election of certain members since the adoption of the Constitution; therefore,

"*Resolved*, That the council of this Association be, and they are hereby instructed to report the names of gentlemen, who were elected on the 17th and 18th of October, 1888, as members of this Association, after the adoption of the Constitution, for election at the next annual meeting of this Association, to be holden in the city of Baltimore, Maryland." The resolution was adopted.

The Association then took a recess until 2 o'clock P. M.

SECOND DAY—AFTERNOON SESSION.

The Association met at two o'clock P. M.

The President—The last paper read was that of Mr. Perkins, on gas coals. I do not see that Mr. Perkins is present now, but if any member has any remarks to make upon that paper we are ready to hear them.

Mr. Nettleton—May I be allowed to say a word. I think we all feel very much in debt to Mr. Perkins for having prepared this paper. It is hardly one that can be discussed, and yet it is a paper that I am sure we are all glad has been written. It gives us a history of the development of the coal mines in the Provinces, and gives us facts with which very few of us have been familiar. I hope at the next meeting of the Association this paper will be followed by another, giving the history of the development of the American coals. I am certainly very greatly indebted to Mr. Perkins for the labor he has spent on this paper, and I think all the members must feel in the same way.

The President—If there are no further remarks upon the paper of Mr. Perkins, we will now listen to that of Mr. Smedberg.

Mr. James R. Smedberg then read a paper entitled:

OBSERVATIONS DURING MANY YEARS' EXPERIENCE IN THE GAS BUSINESS.

Mr. President and Gentlemen of the American Gas Light Association:

In the early part of the year 1853, John Jeffrey was engineer of the Cincinnati Gas Light and Coke Company; and the lamented Thomas Butterworth, Joseph Light and myself were among his young subordinates.

The exhauster was matter of debate—the clay retorts (even of Cliff or Keller) were unknown, and the public regarded gas maker and plumber alike as queer monsters, full of "ethereal hydrocarbons" and solid diamonds.

A favorite Cincinnati setting was one of three iron retorts—the upper being carried on iron bridges from the two lower ones, the arch being a Gothic or pointed one of 5 feet 4 inches span, and fire-stone slabs being used indifferently with Kreischer's tile for the flue-covers. From the crude photometric appliances of those days, Mr. Jeffrey decided that coal gas had a higher illuminating value where he used a box washer than where the jet washer was employed. The washer was invariably set next in sequence of apparatus to the hydraulic main; the trustees of the Philadelphia Gas Works stating in their report to Councils for 1857, however, that those works "first introduced the system of giving increased purity to their gas by means of refrigerating jets thrown into the gas while hot."

The Immersed Multitubular Condenser had not been developed by the distinguished Joseph A. Sabbaton from John Peck's British patent of 1817; nor had Pelouze and Audouin deduced the condensation of the difficult tar vapors from Halley's vesicular theory. The great coke columns of Mann and Livesey had not arisen to give place in turn to the noble Kirkham Knott Scrubber, and to the other implements which logically feed the surface to the water, instead of feeding the water to the surface. The guide-columns of Jeffrey's great single-lift gasholder were handsome Corinthian shafts, arranged in groups of three, as atmospheric condensers; while another successful contractor connected his suspension frames by curved girders at top. In small works, the center-mast gasholder was not uncommon; and it still survives and does good work in some sequestered villages.

Four feet from the pound of coal was considered good work; the regenerative furnace and the whole modern pursuit of high heats were not; and stoppages by naphthaline were exceedingly rare.

Kerosene was no competitor; and that vigorous intellect to which is due the entire growth of American water gas was ineffectual and among the clouds for want of petroleum. There were no regenerative nor incandescent burners. Carburetting, whether by liquid hydrocarbons or by Bowditch's valuable use of residuary naphthaline, was not thought out. Apart from the nearly obsolete wet lime purifier, there was no idea of purification by liquids or in closed vessels. We had neither natural gas nor electric lighting nor Laming's mass; and the apostle of the commercial value of our by-products was silent. The dry valve, the automatic station governor, the jet photometer, the dry meter and the coal-liming process, for which has been claimed the remarkable saving of 700 per cent., were all uncreated.

In fine, the gasman was "dim, remote like Sirius." He was not eternally engaged in some tilt or other with buccaneering capital; nor were there any quirks of legislation, or "comet like return" of patents, to vex his calm, judicial notions of price and purity and candle power.

This sketch of gas lighting in 1853 shows that 35 elaborate monographs would be required to contemplate the industrial progress of 35 years, and thus comply fairly with the title assigned by the courtesy of your committee. You must, therefore, bear with the risky flavor of personal anecdote.

In Norwich, Connecticut, the construction of the hydraulic center-valve was taught by the corrosion of the vertical divisions of the cover, and a consequent passage of foul gas to the burner. Curiously enough, the same unfortunate result occurred 30 years later in Lancaster, Pennsylvania; but in the latter case the center-valve—a dry one—was not in fault. By over precaution of design, the center-valve itself had been provided with a four-way dry by-pass, having wrought iron drip-tubes entering a common seal-pot from each quadrant of the valve-box. The tubes were cut off by corrosion at the water line; the by-pass was in a forgotten corner of the cellar—there was no plan of the works; and, to conclude, the gas showed clean at the third lime box, but stained at the station meter inlet, to which it passed around the lime by preference.

In Knoxville, Tennessee, a Worthington pump had been set on the yard level, 28 feet above the Holston River, and without a foot-valve. It was made effectual by placing the pump at the bottom of a pit sunk 20 feet deep in the tenacious clay, and providing its suction with a strainer and foot-valve.

It next became necessary to change the grade of an 8-inch main from an arc of 15 feet rise to its chord of 150 feet in length. Beyond cutting out at the center the difference in length between the old profile and the new, no joint was broken; and after connecting with a sleeve and recaulking, the pipe was perfectly tight—a sufficient lesson as to the capabilities of the lead joint.

Then the station meter stopped registering. Like many others, I knew the generous skill of Joseph A. Sabbaton, but was ashamed to confess that this meter was too much for me; I wrote in what appeared to be an airy and professional way that the meter "required looking at." His prompt advice, as a brother and an engineer, was "to buy a table, a pipe and some canaster, an arm-chair and a lemonade, and then to sit down in the meter room and look the thing out of countenance." This *was* a settler, to be sure. The trouble was found within 20 minutes to be that the main driving pinion was split, allowing the drum shaft to turn loosely inside of it.

These incidents, trivial as they now appear, were interesting enough at the time.

When appointed superintendent of the Savannah works the leakage was large, with a ton yield of 8,000 cubic feet from iron retorts, without an exhauster. It was some years before the firing on Sum-

ter, and excepting an occasional cargo of Fairmont the coals were imported. Our material was Pelton, New Pelton, Silkstone and Arley; Ince Hall and other Wigan cannels—with some Lesmahagow, less Boghead and a trifle of Albertite. The Company's capital was unwatered, the product being 60,000 or 70,000 feet per day through 14 miles of mains to 1,200 consumers and 450 street lamps. Our lime was derived from the abundant oyster beds of the river delta.

The city occupies a sandy plateau; and close to the outlying residences were, then, forests of pine and live-oak, with here and there a magnolia nearly dead in the clasp of misletoe, trailing moss and yellow jasmine.

Most of the streets were unpaved; and Broad street, in particular, was often flooded from curb to curb by semi-tropical rain. The street had neither declivity nor sewer; but presently a little mule, an ebony bare-legged boy, and a primitive plow ran one or two furrows lengthwise through this Venice, and in a few minutes the water subsided on edge to the thirsty, hospitable sands below. It was, therefore, an easy matter to strip the mains and a few of the services, the leakage falling from an old figure of 22 to a new one of between 7 and 8 per cent.

The consumers' meters were mainly "wet," of the make of Colton, Code & Co., with about 300 of the imported "dry" ones of Croll and Glover. They were all taken out and proved—50 condemned and the rest replaced; the average registration of the entire list being between 1 and 2 per cent. slow. In 1859 the Company adopted Keller's Belgian clay retorts.

A valuable guide, then and through the stormy years that followed, was a special system of monthly statements. The book containing them was ruled and printed in blanks comprising 4 pages for each consecutive month.

It gave the profit and loss account in every detail for the month just completed, for the current year as far as completed, and for the corresponding periods of the preceding year. It similarly included all the working averages, the disposition of all gas registered, the financial condition of the Company, the number of consumers and public lamps, and, in brief, was as elaborate as any formal yearly report. This last must be qualified by the exception of bad debts, the underrun or overrun of coals, and the variation of estimated from actual wear and tear, which was rigorously written off, instead of running on to swell the *apparent* profits and the *apparent* value of permanent accounts. These three elements of doubt were adjusted by closing entries in December of each year, the aggregate of final corrections being represented by a purely trifling figure. The proposition was carefully passed upon by Dr. Francis T. Willis, the President of the Company, before adoption by the Board.

It is unsafe to say that the method can be availed of by companies having over 3,000 or 4,000 meter accounts; but below those limits it establishes certainty of programme, and equal and exact confidence between directors and superintendent, both of which are desirable.

Soon after the establishment of the blockade, we were asked to inflate a balloon, from which Mr. Steiner, a well-known aeronaut, and Captain Lawton, of the Confederate staff, were to take a bird's-eye view of the Union batteries, then being placed by General Q. A. Gillmore, for the reduction of Fort Pulaski.

All arrangements had been made over-night, benches arranged for selected spectators, and the foreman ordered to touch nothing.

On reaching the works at 4 o'clock the next morning (a full half-hour before appointment), I found that he had removed a closing flange from the blank end of a 6 inch pipe, and had led a forlorn hope, by way of magnifying his own office, to the task of tying on the duct against 22-tenths pressure.

All this, beginning in disobedience and ending in murder and almost suicide, while there was a closing valve within two feet of the deadly muzzle of the pipe.

There were several men badly asphyxiated; one man dead, with a broken neck, at the bottom of a 24-foot dry-well; another hung dead by the jaws, between a flange on one side and the brick-work of the well on the other, and the stokers of both watches nearly mad with panic.

The flooring of the little valve house had been taken up the day before, so that it was an easy thing for me, after knocking off the lids, to kneel on the beams and close the valve. As I reached out vaguely for support against the intolerable gas-flow, my hand rested on the still face of the suspended man. He was extricated; and a big-hearted Irishman, whom I had discharged a day or two before, took the slings from under my own arms, and went down into the fatal well and retrieved the other body, myself of course, watching his signal rope. Three or four men, sprawling about the yard in idiotic attitudes, with bloodshot eyes, were revived by heroic doses of the standard remedy; and the balloon was filled, went up, and presently came comfortably down in the tender mud of a neighboring rice field.

The tragedy teaches the common mind that discipline is good; but Mr. Steiner (tall, muscular, and the last to be suspected of superstition), told me, "all tears like Niobe," that it happened at all because it happened on Friday. Observe, however, as an attaché who married a Georgia heiress put it, that "finance is conservative." My peremptory discharge of the culprit was commuted by higher authority, for fear that the two widows might enforce exemplary pensions from the Company.

Our stock of coals ran low; the railroads were occupied by troops and ordnance stores and commissariat; and the blockade was impenetrable. We were in what a bishop styled as a "dilemna," which could never have been solved but for an humble German named Breisach, who had previously brought Pettenkoffer's wood gas to the attention of Philadelphia gas officials.

In his report for 1854, Mr. John C. Cresson stated, "as a matter of official record, that a cord of ordinary fire wood, of any of the varieties brought to our market, will furnish nearly twice as much illuminating material as is obtained from a ton of the best Pittsburg coal;" and he mentioned, on the same page, that this wood gas was "not only as cheap but much cheaper than that made from coal."

In his report for 1855, he claimed a yield of 15,000 to 17,000 cubic feet of 27½ candle gas from a cord of dry oak—the candle being Judd's patent sperm.

His report for 1856 gave the following analysis of wood gas by Doctors Wolcott Gibbs and F. A. Genth:

	Gas from Pine.	Gas from Oak.
Specific Gravity	0.663	0.580
COMPARISON.		
Hydrogen	32.71	30.44
Light carburetted hydrogen	21.50	33.12
Olefiant and hydrocarbon vapors	10.57	6.46
Carbonic oxide	27.11	26.11
Carbonic acid	4.90	0.48
Oxygen	0.66	none.
Nitrogen	2.55	3.39
	100.00	100.00

These gases were taken to New York for analysis, and the reported illuminating power was 26 candles.

Early in the Philadelphia experiment, a cellular form of iron retort was devised by Dr. Charles M. Cresson; and prior to the opening of the war the gas companies in Charleston and other Southern cities had been making wood gas in settings of these retorts.

With these precedents, and no gas literature beyond early numbers of the *London* and *American Gas Journals* and a copy of Hughes' valuable but unpretending work on coal gas, we began making wood gas from the splendid light-wood of Southern Georgia—our type gasholder at once showing 24-tenths' pressure instead of 22. Our burners had metal tips; so it was easy to bore out the fishtails and saw out the batswings to accommodate the higher specific gravity of the new product. The percentage of carbonic oxide in the purified gas varied from 18 to 35 per cent.

For a few weeks all was well; but the cementing carbon burnt out of our clays, and we were compelled to replace them with iron retorts 20 in. x 12 in. x 8 ft. 0 in., at a cost of 12 1-2 cents per pound. Then the ash swept out of the fire-bags (for we had to fire with wood) and the flue setting of the elder Sabbaton had to be modified by flues larger at back than at front, so as to give the flue-rakes control of this difficulty. All the time, the furnaces proper formed a peculiar wood clinker.

Finally, we found that the wood ought not to be split too small, and that 1 1-2 hour charges were most advantageous.

After this we had no manufacturing trouble throughout. The consumers were satisfied, because the illuminating power was as high or higher than before; and the Directors were naturally pleased, because the Company's whole investment was saved. We made 10,000 cubic feet per day per retort, the yield being from 8 to 12 feet per pound, or from 24,000 to 36,000 feet per cord of wood, according to the relative percentages of resin, fibre, and water composing it. These averages refer to the wood actually carbonized—about an equal quantity being additionally used for firing. There was local demand for far more of the wood-tar than we could supply. We quenched with water the residuary charcoal, which, though of poor quality enough, found ready sale. We had no standard candles; but I am thoroughly satisfied that the gas had a value of not less than 18 candles.

It so happens that Mr. Thomas Turner, President of this Association, was connected with the late B. P. Brunner in the conduct of the Charleston gas works for some years preceding the war, and throughout its course; and he will probably agree as to the singular beauty of the wood gas flame.

Reissig has given us a valuable work on wood gas and peat gas; Wagner's Technology contains a brief and reliable resumé of the subject; and King's Treatise, while through a clerical error confounding a cubic inch with a cubic meter, gives a page or two to German facts—to some English experiments—and to the methods applied by Dr. A. W. Wilkinson in the Mutual gas works of New York City.

All these, however, differ widely between themselves, and, at best, have little value as criteria of the Savannah results. In Red Bluff, California, many years later, I found the average cord of Sierra Nevada pitch pine to weigh 3,139 lbs.; its yield being 21,000 feet of nearly 17 candle gas.

The volume, character, and behavior of the product are largely modified by the amount of moisture in the wood, by the form and temperature of the retort, by the weight and duration of the charge, and by the nature and size of the burner employed.

As against Mr. John C. Cresson's figures, quoted above, *King's Treatise* says that "old oak has been found to yield 4,500 cubic feet of 5-candle gas per ton." This is about equal to 6,000 feet per cord; assigning a joint cord value of about one-sixteenth of that given by Cresson.

In 1868, a correspondent who suitably signed himself "Ignoramus," wrote to the London *Journal of Gas Lighting* as follows:—

"My gasholder, 52 feet high, gives 6 inches pressure. . . . And

again, why does a gasholder 52 feet high not give 6 5-10 inches pressure on top, instead of 6 inches?"

As a fact, an inflated gasholder *does* give uniformly more pressure at the top than at the water line: and "Ignoramus" might as well have tried the experiment before rushing into print.

My motive in quoting him is to offer a paradoxical fact, which has not been completely accounted for. The process to your verdict will, therefore, be precisely the reverse of that followed by the critics of the bothered Englishman.

In 1878, I was employed to connect the mains of the Vallejo (California) Gas Company with the government gasholder in the Mare Island Navy Yard, the impediment being a tidal strait some 1,400 feet wide and 30 feet deep. The fee was a fair one, but conditioned upon the success of the work.

At the end of the Georgia street wharf, on the Vallejo side, I placed an Otto engine, a piston gas pump, and a tension cylinder, with quick motion gates to act like a fitter's pump in blowing out any water condensed from the gas in the droop of the traversing-pipe. The inlet to the gas-engine was, of course, provided with a little gasholder to ensure regularity of explosion.

The next task was to get a 2-inch galvanized wrought iron pipe across the strait. A series of barges were moored, and the pipe jointed on them ready for lowering; but some tipsy sailors found an obstacle in the way of their evening expedition, and cut the mooring ropes, so that the whole flotilla swung with the tide, and twisted the pipe almost into a knot.

We then decided, on the hint of Mr. Fagan, the Vallejo Company's Superintendent, to place a capstan on the Mare Island side, and pull the pipe across by sheer strength. So this was done, with a beveled chair under the leading end of the pipe, and a buoy tied to it in case of accident, coupling on length after length from the Vallejo wharf. The completed pipe, laid like a hollow rope on the bottom of the strait, was connected at both ends, the engine and pump were started, and the navy yard was, for the first time, lighted with coal gas instead of gasoline.

Then it was the unexpected which happened, or rather the expected which did not happen. During three years the pipe was never trapped off—there was no condensation of water vapor in 1,400 feet of pipe laid in water, with a drop of 30 feet in the center—the tension cylinder was never used.

It occurs that the gas may have left the pump under so high a temperature, due to compression, as to retain its carrying power of the vapor through the long conduit, because the linear velocity through that conduit was so high; in other words, that a larger pipe would infallibly have been trapped. The friction developed by high velocity against the interior surface of so small a tube must also have tended to keep up the temperature of the gas flow. The gas left the pump at 100° Fahrenheit, and went across at the rate of 2,250 cubic feet per hour. The linear velocity was, therefore, nearly 20 miles per hour, and the time of transit about 50 seconds.

While on the subject, D'Hurcourt gives the following in his French work on gas lighting, in reference to atmospheric and immersed condensers:—

"The tubes can only release the quantity of heat lost from their exterior surfaces, whether those surfaces radiate into space, or are cooled by contact with water.

"Where the cooling tubes radiate freely into space (representing the excess of temperature) the quantity of heat given off per hour per square metre, expressed in calories, supposing the difierence of temperature to be constant, is given by the formula $K(1+0,0066\ t)\ t$. K is a co-efficient which varies according to the nature of the surface. For cast iron, Peclet has found K to be 7.70; but as for lamp black, K is equal to 9, and as the tube surface is more nearly that of lamp black, we will assume the value 8, modifying the above formula to $8\ (1+0,0066\ t)\ t$.

"The heat lost per square metre per hour, where the tubes are entirely submerged in water, and supposing that the water has no current except that due to its heating, is independent of the nature of the enclosures, and is closely stated, according to Peclet, by the formula $43\ (1+0,105\ t)\ t$. This formula is found to be exact, so long as t, representing the excess of temperature of tube above liquid remains below 40°."

It is for two reasons that I quote these formulas, which are of easy reduction from Centigrade to Fahrenheit, and from square meters to square feet.

The first is that Peclet's formulas do not seem to be given in any of the gas books published in our language.

The second is that D'Hurcourt proceeds in his really delightful work, abounding in technical mathematics, to calculate in a parallel table the relative powers of the two systems, and *misplaces several of his decimal points*. The errors, flagrant as they are, were copied and recopied through several editions of his own work—of Hughes—and of Clegg; and were first pointed to in an ephemeral letter to the American Gas Light Journal as late, or later than the year 1868. The offender would have had short shrift in these later and better days of analytic study.

I found the Hartley shale, or Wollongongite, of Australia, to yield 14,000 cubic feet of 80-candle gas to the ton, the figure of illuminating value being assured by many tests made of dilutions of the rich gas with coal gas of known character, and with air. The dilution tests were calculated by direct proportion, and were practically coincident. The Manhattan Gas Company found 13,716 cubic feet of 133-candle gas from the same material, also by dilution; but employing the theorem of squares, the authorship of which is claimed both by William Farmer and Henry H. Edgerton. One of Mr. Farmer's letters of 1874 closes as follows:—

"This new law shows what an intense light might be obtained if we only had a burner that could consume 100,000 or 200,000 cubic feet of gas per hour, with as perfect combustion as Suggs' London Argand."

Mr. Farmer might well say so, for

$$\frac{(200,000)^2}{(5)^2} \times 16 = 25,600,000,000.$$

That is, according to the theorem of squares, and with a suitable burner, 200,000 feet of 16-candle gas would give as much light as 25,600,000,000 of standard sperm candles; being at the rate of 128,000 candles to the foot; or to express it differently, each cubic foot of gas burnt according to the new theory would do the work of 1,600-000,000 feet under the present system.

Some of us, however, have seen 16-candle gas commanding $5 per thousand; and many of us now see 30-candle gas selling at $1.25—a clean drop from $7.50 to $1.00 for equal light. It is not safe, therefore, to assert that anything is impossible.

We owe to Mr. Farmer the Kindergarten chemical blocks, and a formula for air-dilution which agrees with the observations of Dr. Carl Schultz, and is a far more accurate guide than the nearly forgotten Erdmann gas-power.

We are all aware that our Bunsen photometer varies in its accuracy according to the burner and quality of gas employed; but it cannot be too positively added that its verdict, when the blue light of an incandescent burner is to be compared with the red light of a candle, is absolutely worthless for the purposes of the human eye.

In spite of the many and important topics omitted from this paper, it is already long enough.

Even in regard to the burning subject of water gas, it is well only to remind you that it acted on a service layer in Lancaster precisely like nitrous oxide. Let the why and wherefore of his capers be relegated to the "question box."

On motion of Mr. Slater, a vote of thanks was tendered Mr. Smedberg.

In Memoriam.

Mr. White—If there is no discussion to ensue upon the very interesting paper of Mr. Smedberg, there is another matter upon which I would like to occupy the attention of the Association for a few minutes.

It seemed to me, Mr. President and gentlemen, that while our action yesterday relative to the deceased members of this Association was in strict conformity with what has been the usage of the Society for a number of years (a usage that is justified by the circumstances in most cases), the record of our dead in the past year presents us a name that it seems to me unjust that this Association should simply vote that that name be placed upon our records, and no further notice of it taken. While that list numbers five names, those of us who commenced with this Association in its first day, who have lived through and borne the heat and burden of the struggle of sustaining it, are painfully aware that we are steadily getting older, and that new men are coming in and pushing us toward the western gate of life; and it is not just to this Association, nor is it setting a fitting example to these younger men who will soon fill our places, that the names of men who have been active from the first should simply be placed upon our rolls as dead. "Dead upon the field of duty" was the highest praise that could be written after the names of the Old Guard, when at roll call a voice was missing in response. It is not enough, Mr. President, that we should only thus notice the death of a man like William Helme, who was with us the first day when this Association was born, a man who had been with us at every meeting, a man of whom the lines of Emerson could not have been more fitly written if applied directly to him, that

> "July was in his sunny heart;
> October in his liberal hand,"

than if they were written for that very dead man. It seems to me that, without disrespect to the other gentlemen who have passed away from among us, this Association may stop in the midst of its business for a brief time to speak again his name, to recall again his genial presence, to remember his hearty friendship for us all, and his earnest activity among us, and say a kindly word that shall recall his genial face, and that it will be time well spent.

That Mr. White, of Houston, Texas, was also an old member, who gave us such of his time as his busy life could afford; that Mr. Collins, and the genial Murphy, and the kindly Pratt, have also joined him in passing beyond the Styx, it is no discredit to them, and it is no discourtesy to their memory, that this Association thus speaks of Mr. Helme.

We have with us a fellow member, one who was bound to Mr. Helme by the warmest ties of friendship—a tie that no member of this Association held more closely, for he was his business partner, and his life-long friend—and I ask the courtesy of this Association for a few moments in order that Mr. McIlhenny may speak to us, as no other of us can speak, a few words that will bid us pause in our busy career, to remember this genial friend, this warm and active member of the Association? that he may not pass away into his grave, beyond all human sight forever, with the mere record upon our books that he is dead. He was a man in every sense of the word. No older member of the body, no younger member of this body, ever touched that man for friendship or information, that both were not warmly and readily accorded. I ask, therefore, that we grant to Mr. McIlhenny the privilege of a few minutes in

the midst of our business to lay upon the grave of his dead friend, and ours, the tribute of a single flower of recollection.

Mr. John McIlhenny—Mr. President and gentlemen of the Gas Light Association, the words that have just fallen from the lips of our friend, Captain White, express far more eloquently than I can, the praises of our departed friend, William Helme. I am very highly gratified in coming to this meeting to hear expressions of regret from every one who has spoken to me about him, to hear his virtues extolled, and to listen to sentiments of good will from every member who has mentioned his name. I can say that he was entirely worthy of all commendation and praise from those who knew him. When this Association met last year in New York City and it was announced that the next meeting would be held in the city of Toronto, Mr. Helme said to me, "We will have to be there," but alas! how many of us are mistaken in our expectations. He is not here to answer to his name and we will no more hear his voice in our deliberations. He has passed beyond the Western gate whither we are all tending, and especially those of us who have passed fifty; to us the door only opens outward, and the loss of our old time friends is irreparable.

As you all know, Mr. Helme felt an exceedingly deep interest in the welfare of this Association. He was present at its very beginning, and he lived long enough to see it become a large and prosperous Association, and to see the gas business, from its small beginning, grow to the second in importance of the industries of the country.

For several years Mr. Helme had been in rather poor health, although at these meetings, in his business life, and at his home, he appeared always to be hopeful and cheerful. On the third day of last June, a bright Sunday morning, when everything was peaceful and quiet, and when he was in unusually good spirits, he was going to church with his family. While walking along the road he stooped to pick a daisy and hand it to a little child; just at that moment he was stricken by the hand of death. He lingered for a while and on the 12th of June he went to fairer skies, and a happier home, as I firmly believe.

I have known him for many years; I was his business partner, and also very closely associated with him as his friend. When young we were employed by the same firm in building gas works, and during all that time I have only known him as a correct, upright, honorable, high-toned man. I have never known him in his private conversation to use an expression which he would be unwilling to use anywhere. He was a man of remarkable purity of character, and was also a man of great liberality. He took a deep interest in many things outside of the gas business, and was an ardent member of the Franklin Institute for the promotion of science. In every department of business enterprise, as well as in everything he took up, he was at all times earnest and sincere. You all know that he was upon one side or the other of every question that came before this body for consideration; a generous opponent, and a staunch advocate.

I believe this is all I would say; I thank Captain White most sincerely for this opportunity of giving expression to my kindly regard for Mr. Helme, and my deep regret that he has been taken from us.

Mr. Fodell—It was my good fortune to be intimately acquainted with Mr. Helme, in this and in other Associations. What has already been said of him is true indeed. He was a man endowed with more than ordinary talent and ability of the faculties necessary in his profession; and was always willing and pleased to impart his knowledge, gained by long experience in business, to those asking his advice. I desire to add this, my feeble tribute to his memory. In all his relations and intercourse, whether in business or in social life, he ever exhibited in himself the characteristics of the gentleman. The death of such a man as Mr. Helme is a loss to this Association.

Mr. White—I move that the Secretary of this Association be directed to communicate to the family of Mr. Helme an expression of the loss of this Association by his death, and our sympathy with them in their loss. It is just to ourselves and just to them that we should do this.

The home life of Mr. Helme was probably one of the most tender and beautiful features of that excellent man's whole career; and it is one of the most charming thoughts of his family that his wife mourns to-day for a lover lost rather than for a husband dead. The tender affection existing between that man and his wife was most beautiful in its expression.

It seems to me that this Association would be lacking in self-respect if there was not conveyed to that mourning woman something from his associates in his life-long business that she can treasure among her other memories of this good man, as the opinion in which we held her partner in life.

I, therefore, move that the Secretary be instructed to write to Mrs. Helme expressing our sympathy and sincere regret at his death.

Seconded by Mr. Stiness, and adopted by a rising vote.

THE QUESTION BOX.

The President—We will now take up the question box. The first question is:

"*What is the extra cost on wear and tear of meters where iron purification is used?*"

Mr. Somerville—I do not know what the extra cost is; but I believe it is something. I am very sure that oxide of iron does injuriously affect the meter, because I notice that when I use it the diaphragms from some cause or other become stiffened. That was one trouble. There was a kind of deposit that I never before witnessed in the meter, that appeared after I began to use the oxide of iron. How it came there I cannot tell; but I am firmly convinced that oxide of iron purification does injuriously affect dry meters.

Mr. Scriver—We use oxide of iron to a very large extent in the purification of our gas, but we do not notice that its use is in any way injurious to our meters. It may be owing to the fact that we do not allow our meters to run over five years without overhauling—the law of this country is such that we have to take our meters out every five years. I feel warranted in saying that the oxide of iron purification does not injure either the consumer's meter, or the station meter at the works.

Mr. Somerville—Your meters are all wet; are they not?

Mr. Scriver—No, sir; they are all dry.

Mr. Young—Do I understand you to say that they are required to be taken out and not used again? The law, as I recollect it, is that they have to be tested every five years, and if found incorrect they have to be made correct.

Mr. Scriver—That is it, certainly; they have to be tested every five years.

Mr. Young—I have been using oxide of iron for ten or twelve years; and I was not aware of any injurious effect upon the meters, or on the illuminating power of the gas, until we put in our Standard scrubber. After that we discovered a little deterioration in the illuminating power. Before that time we used exclusively the oxide of iron for purification, and had no trouble with the meters nor with the illuminating power.

Mr. Prichard—We have been using oxide of iron for quite a number of years and on receiving this question from the Secretary I inquired of the man who examines our meters as to its effect upon the meters, and he said that he could tell no difference between them and those in the other cities in Massachusetts where they are using lime exclusively. He said it was impossible to tell the difference. In fact he seemed to think that a small amount of ammonia in the gas, purified by iron oxide would be rather a help to the diaphragm than an injury to it. But the last week before I came away we had occasion to go into the station meter, and found that the inlet pipe had been entirely corroded from the oxide. It had not rusted from the outside, but we found a deposit of matter there which smelled like napthaline, and looked like a cross between iron rust and iron sponge. That material, whatever it was, had eaten clear through the galvanized iron of the meter.

"*What is the best way to treat men who, while working in the trench, are overcome by gas?*"

Mr. Clark—I have a recipe given to us by a prominent physician, which seems to be a very good one. The rules are as follows:

1, take the man at once into fresh air. *Don't* crowd around him; 2, keep him on his back. *Don't* raise his head, nor turn him on his side; 3, loosen his clothing at his neck and waist; 4, give a little brandy and water; not more than four tablespoonfuls of brandy in all. Give the ammonia mixture (one part aromatic ammonia to sixteen parts water) in small quantities, at short intervals, a teaspoonful every two or three minutes; 5, slap the face and chest with the wet end of a towel; 6, apply warmth and friction, if the body or limbs are cold; 7, if the breathing is feeble or irregular, artificial respiration should be used, and kept up until there is no doubt that it can no longer be of use; 8, administer oxygen.

Some of these rules I have myself used, and I think very successfully.

Mr. A. C. Humphreys—I will add to what Mr. Clark has said, that these rules were not prepared hastily, but were obtained from a physician who was familiar with the subject from personal investigation.

Mr. Harbison—I would like to inquire whether he experimented with the same man or not.

Mr. Clark—The experiments were made on animals.

Mr. White—I have been told by a physician who has had considerable experience in the treatment of those overcome by gas, that there is no more direct or certain way to overcome the effects of the gas, if the man is sensible enough to swallow, than to give him a tablespoonful of olive oil, or of common sweet-oil. If he can swallow it, give him a tablespoonful of oil, and then give him a little milk, or some brandy, or whiskey, or whatever stimulant may be at hand. Of course you should loosen his garments, and place the man in easy position to breathe freely, and if you can, create a circulation of air by fanning, or by placing him in a draught. The handiest thing usually for gas men to get, when a man is overcome in the trenches, is to get at a neighboring drug or grocery store a bottle of sweet oil and some milk, and it is my experience that, whether the man is overcome with water gas or coal gas, nothing acts so quickly in restoring his breathing as sweet oil. It is not unpleasant to take, it lubricates his breathing apparatus, and the man will recover very much more quickly. It is founded upon many years' experience with men who have been overcome with gas, and I have used it myself when suffering from the same cause.

Mr. Somerville—I was once engaged in taking off the top of a station meter, inhaled too much gas, toppled over, and was carried out insensible. I understand that I was taken to the open air, my collar and waist-coat were loosened, and I soon recovered consciousness: but I did not get well until the contents of my stomach were ejected. The whole system seemed to be affected by the gas. A few weeks ago I had to take my foreman out of a hole. It was a very serious matter—he was a nice man, and I was sorry to see him tumble off like that. We dragged him out as quickly as we could, unbuttoned his vest, fanned him, and he soon recovered. That was with coal gas. Still he felt the effects the balance of the day. With water gas it is entirely different. Then it is a very serious matter indeed. We always take extra precautions in dealing with water gas. It does not seem to produce the same effects as coal gas. It seems to

touch the blood, and it takes men some weeks to get over its effects. In fact I know a man who has never gotten over it. If anything can be devised which will overcome the effects of the inhalation of water gas it is very important that we should know it. I have no doubt that someone is asking this question in all sincerity, and if we can think of anything which would be an effectual remedy it will be a good thing to come before the meeting.

Mr. Scriver—I believe that very recently an inspirator has been invented, which fits over the nose and mouth, and enables the man to remain in an atmosphere where gas is escaping for a great length of time.

Mr. Harbison—Two or three years ago I had some experience in this matter, and it was a little different from anything which has been stated here—I was not within reach of physicians at the time, and so could not avail myself of their services. Some workmen were laying a large main, connected with two six-inch pipes, and had to make a temporary connection over night in order to maintain the supply of gas in one section of the city. The gas escaped, and within ten minutes seven men became insensible in the ditch. We took the pressure off as soon as we could, removed the men to the open air, put water upon their faces and necks, gave them a mixture of whisky and water, and, as soon as they could swallow anything, I gave them apples to eat, and the acid of the apples immediately started the gas out of the stomach. Just as soon as I could reach it I gave them some strong, hot coffee, and very soon they were ready to take their supper pails and walk home.

Mr. Watson—I have had men in the same condition, but I administered vinegar to them, which I suppose acted in the same way as the apples. I gave them vinegar with eggs in it—breaking the eggs in the vinegar and letting them drink it. I find it very effectual.

Mr. Kuehn—On two different occasions when one of my men was overcome with gas, I called a physician, who injected the carbonate of ammonia. The man was ill eight or ten days after from the effects of it. He became so bad the second time that I did not put him back to that kind of work again.

"*What advantages are gained by using high gravity naphtha for water gas?*"

The President—I will call on Mr. Humphreys to answer that question.

Mr. A. C. Humphreys—I will say, very briefly, that one of the advantages of high grade naphtha for water gas is that it will allow you to make the gas from the old style apparatus. If you will think of all that means, that about answers the question. There are a great many disadvantages in the use of high grade naphtha. Its increased danger specially. I should not advocate the use of high grade naphtha in making water gas. It is unnecessary.

Sunday Labor.

Mr. Scriver—I would like to ask this question: Is there any gentleman present who can give any information with regard to the reduction of Sunday work in our gas works? How can Sunday labor in our gas works be reduced—especially with reference to the working of the retorts?

Mr. Harbison—I would say it can be done by striking off the lids from the charges that are burned off, and slacking the fires, and not charging them again. We ought to be able to do that, and still keep a sufficient supply. It may in some cases be thought insufficient; but if you have storage room enough, work the retorts well, and have enough of them running during the week, there would be no difficulty at all in doing away with Sunday work in the retort house—except so far as taking the lids off, which is a very slight work if you do not draw the charge.

Mr. Smedberg—Is there any injury to the retorts?

Mr. Harbison—Not at all. You leave the charge in the retorts and strike the lids. We have made a practice of it for over 15 years.

Mr. Scriver—Do you find any difficulty with the purifiers?

Mr. Harbison—Not a particle.

Mr. Smedberg—I suppose that on 500 occasions I have had to lay off two or three benches at a time; and I have never yet charged one of those benches after an expiration of 24 hours without having at least one-half of the retorts leak.

Mr. Robert Baxter—I will give you a little of my experience with regard to Sunday labor. When I came to our present works our retort men worked Sunday and Saturday, both alike—at least they worked on Sunday the same as on Saturday or Monday, but they knocked off at about two or three o'clock on Monday morning, and remained off until the afternoon. That was while I was Assistant Manager of the works, and had to do as I was told. On my appointment as Manager I at once changed the order of the procedure. We knocked off Sunday work on Sunday morning, at seven or nine o'clock, just as the quantity of gas in our holders enabled us to do. We quit as early Sunday morning as possible. We have never had a crack in our retorts. We never slack the doors. We have a three-inch pipe to the hydraulic main, with a valve on it, and about half an hour before the charge is worked off we open that valve and shut the outlet valve, and never a particle of air gets in. The boxes are just as tight when we start work again as they are on Sunday morning when we stop. We never slacken the doors. Our men get full pay. If something happens in the winter so that they need to work the whole 24 hours of Sunday, they do it; but otherwise the men get off on Sunday morning as early as they can.

Mr. Harbison—We have no valve on the hydraulic main, but we slacken the lids. Our men are paid in full for seven days work, but if the necessity occurs for doing any work on the Sabbath they are notified, and they come and work without extra pay, for they are already paid for it. We were led to try this way of doing it because our experience showed us a good many years ago that the retorts were not injured by being out of use a portion of the time. We were at one time situated where we had to furnish, night by night, between 80,000 and 90,000 cubic feet from a 60,000 foot holder; and we were obliged to keep two benches extra to use from dark until 12 o'clock, and then leave them off during the rest of the 24 hours, because our holder would be full. We found those benches were not injured, and that was the reason why we saw that we could (if we provided more storage room) do away with Sunday labor; so we at once built a new holder, and now have a storage capacity for 33 per cent. more than the consumption, and have no difficulty at all. Many members will remember that this subject has been frequently discussed before the Association during the past 10 years; and I can only add to what I have before said, that continued practice in this line confirms us in the experience and opinion that it is wholly unnecessary, as far as the working of the retorts is concerned, to do work on the Sabbath in the retort house, if you have sufficient benches, and storage capacity for the gas without it. We do not work, as some engineers do, on the Sabbath to make up whatever deficiency there may be in the other six days of the week.

Mr. Scriver—Does Mr. Harbison leave the coke in the retorts over Sunday?

Mr. Harbison—Yes; we leave the coke in until we charge up again. I will add to what I have already said that we had had no experience at all with regenerative furnaces until last Sabbath. That was the first time. We had only been charging our new house ten days, and last Sabbath we treated the regenerative furnaces in the same way precisely. I was careful to note on Monday morning what the effect on the retorts was, and I could not observe that there was any indication of injury. When we started our gas was quite as as good as at any other time, showing that the retorts had not sustained any fracture, as no air had been drawn in.

Mr. Watson—At what time do you start on Monday morning?

Mr. Harbison—We start up on Sunday evening.

"*Is there any way to prevent naphthaline from getting into street mains and services? It does not show itself in the works, but in the inlet drip of the holder it causes me many restless nights.*"

Mr. Clark—I have tried many ways of keeping naphthaline out of the street mains and services, but from my present knowledge the only way we can recommend is to stop making gas at that works.

Mr. Cole—In answer to the last question I will state that to prevent trouble from naphthaline, I purchased an old tank, similar to those used under cars for conveying gas for illuminating the cars on a railroad, stationed it in the cellar, and attached to it a steam pipe, and filled this tank two-thirds full of ordinary naphtha, or raw benzine, and at stated times (once or twice a week) I turned on the steam and vaporized that naphtha into the gas—either before it goes through the center seal, or beyond. I have it so connected with steam pipes that I can take it directly from the pipe into the holder, or through the center seal or scrubber, or any way whatever. In that way I have been able to keep down naphthaline and have had no trouble on the street with any of the services.

Votes of Thanks.

Mr. White—Is there any further business before us, Mr. President?

The President—There is no further business. There is a paper here, but under the ruling of the Association we cannot read it, as the author is not present.

Mr. White—Then I move you, Mr. Slater, as the incoming President, that the thanks of this Association be tendered to our retiring President, Mr. Turner, for the courteous manner in which he has presided over this meeting; and that we express our sympathy with him in the accident which recently befell him, as well as our appreciation of his sense of the duty which he owed to this body and which prompted him to come thus far from his home, while suffering so severely, in order to preside at our deliberations.

Mr. Harbison—I second that motion.

The motion was put by Mr. Slater and unanimously adopted by a rising vote.

President Turner—Gentlemen, I can only thank you for your expression of sympathy, and for your courtesy and indulgence during my term of office.

Mr. Scriver—I believe that some of the gentlemen who attended this meeting intend returning to their homes by way of Montreal; and I would like to extend an invitation to any who are going that way to favor us with a visit. We are carrying forward very large extensions in our works this year, and we shall be delighted not only to show them to any of the gentlemen who may visit us at our works, but also to take them driving around and on top of our beautiful mountain, and around the city, and to show them all the sights of the city of Montreal that may interest them. I would be glad to know how many are going that way, in order to provide for them; and I will ask any who intend to go that way to rise. [Five members arose.] I can assure you, gentlemen, of a cordial welcome to the hospitalities of Montreal.

On motion of Mr. A. C. Wood, seconded by Mr. White, the thanks of the Association were voted to the Secretary, Mr. C. J. R. Humphreys, for the very able manner in which he had conducted the business of the Association during the past year.

The Secretary—Mr. President and Gentlemen: I am very greatly indebted to you for this kind expression of your appreciation.

On motion of Mr. Lindsey, seconded by Mr. Graeff, a vote of thanks was given to the Executive Committee for the faithful way in which they had performed the duties of that office.

Mr. Somerville—I move a vote of thanks to Mr. Friedrich Lux for his kindness in leaving that beautiful instrument—the Lux balance—here for our examination. I have myself been much edified by examining it; and I think it is as little as we can do to return a formal vote of thanks to him for his kindness. [The motion prevailed.]

Mr. Stedman—It occurs to me that we have overlooked the Committee of Arrangements in the expression of our gratitude. I, therefore, move you that we offer a vote of thanks to the Executive Committee for the very efficient manner in which they have made the arrangements for the comfort and well being of the members here, and for the very interesting meeting that we have had. [The motion prevailed.]

Mr. Page—I now offer a resolution of thanks to the local press for their able reports in the daily papers. [Adopted.]

Mr. Stedman—I now move that we tender a very hearty vote of thanks to the local Gas Company for what they have done for us, and for what we are about to receive. [Adopted.]

The Association then adjourned.

The Market for Gas Securities.

Although a month has elapsed since we made any report on the state of the city gas share market, our present quotation for Consolidated is similar to the one then given. Equitable is somewhat weaker, however (115–120), while Mutual shows no change. Brooklyn shares are steady to strong. Chicago Trusts moved up sharply, standing now at 42½ bid, as against 34½ four weeks ago. The disposal by the United Gas Improvement of its Trust holdings seems to have removed a discordant element from the body; although we are obliged to confess that the retirement of such a shrewd interest from the Directorate does not look at all reassuring. Yesterday (Nov. 13) the Chicago Council passed a resolution instructing the Corporation Counsel to present a bill for the consderation of the Illinois Legislature to allow the municipality the right to build and operate a corporation gas works. This, however, amounts to little or nothing. In St. Louis we are promised a gas war, owing to the belief possessed by Capt. Keiser that the Laclede Company is in control of the situation—which it undoubtedly is. We strongly advise the purchase of Laclede shares. The Boston situation seems to be as far away from settlement as ever. We think that the state of the general market ought to be satisfactory to gas shareholders.

Gas Stocks.

Quotations by Geo. W. Close, Broker and Dealer in Gas Stocks.

16 Wall St., New York City.

November 16.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share.

	Capital.	Par.	Bid	Asked
Consolidated	$35,430,000	100	81¼	81¾
Central	440,000	50	—	60
" Scrip	220,000	—	47	57
Equitable	4,000,000	100	115	120
" Bonds	1,000,000	—	113	115
Harlem, Bonds	170,000	—	—	—
Metropolitan, Bonds	658,000	—	115	118
Mutual	3,500,000	100	99	100
" Bonds	1,500,000	1000	101	103
Municipal, Bonds	750,000		—	—
Northern	125,000	50	30	—
" Scrip	108,000			
Yonkers		50	90	100
Richmond Co., S. I.	300,000	50	55	60
" Bonds	12,000	—	—	—

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GAS GOVERNORS,

Gas Balance

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FOR GAS RETORTS.

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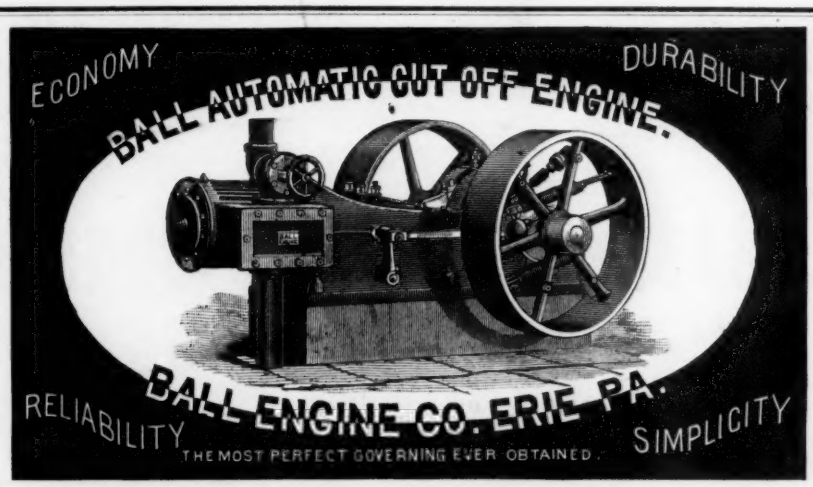

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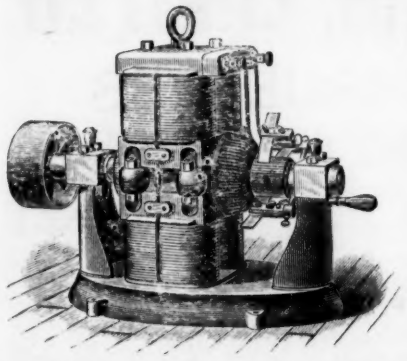

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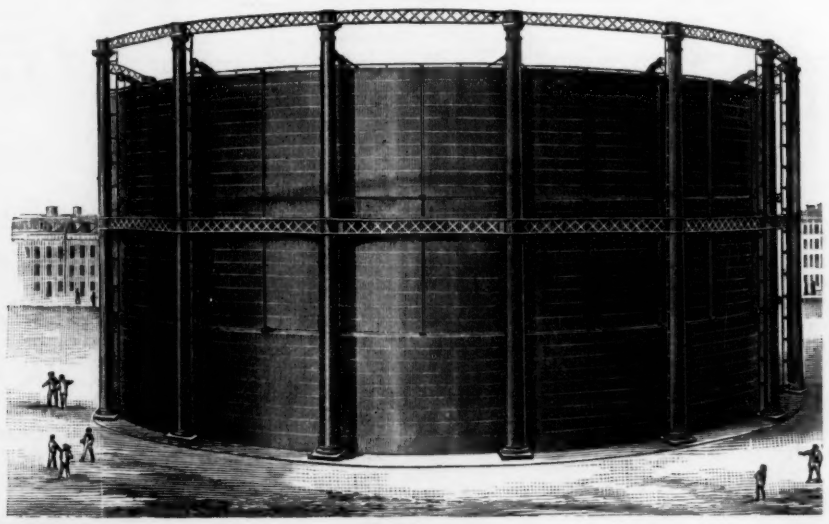

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PATENT "STANDARD" WASHER-SCRUBBERS

Erected and in course of construction at present date:

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Altrincham	600,000
Adelaide	600,000
Aldershot	200,000
Allegheny, U. S. A.	1,000,000
Ashton-under-Lyne	1,250,000
Amsterdam	1,500,000
"	1,500,000
Annaberg	200,000
Arcachon	100,000
Animal Charcoal Co	200,000
Altoona, U.S.A.	350,000
Buxton	250,000
Bradford	1,000,000
"	1,250,000
"	1,250,000
"	1,250,000
"	1,000,000
"	1,000,000
"	3,000,000
Bremen	150,000
Baltimore, U.S.A.	1,000,000
"	1,000,000
"	1,000,000
Balmain, N.S.W	125,000
Bishops Stortford	150,000
Blackpool	400,000
Brussels	1,250,000
"	1,250,000
"	750,000
"	1,250,000
Banbury	250,000
Birmingham	5,000,000
Birkenhead	2,500,000
Blackburn	1,500,000
Bochum	600,000
Burntisland	250,000
Boston, U.S.A.	2,000,000
Brisbane	1,500,000
"	300,000
Burton-on-Trent	1,500,000
Barcelona	350,000
Barking	100,000
Baerlien & Co	20,000
"	20,000
Bombay	400,000
Buffalo, U.S.A., Mutual	750,000
" Citizen	500,000
Brookline, U.S.A.	500,000
Bergen	350,000
Berlin	1,250,000
Bournemouth	1,000,000
Bridgeport, U.S.A.	500,000
Brunswick	300,000
Beck & Co., St. Louis	100,000
Barmen Rittershausen	600,000
Bexhill	125,000
Brooklyn, U.S.A.	1,000,000
"	1,000,000
" Nassau	1,000,000
Brunner, Mond & Co.	400,000
Cheltenham	2,000,000
Cannes	200,000
Croydon	1,500,000
Copenhagen	200,000
Clevedon	200,000
Columbus, U.S.A.	500,000
Cincinnati, "	1,500,000
" "	1,500,000
Chicago "	3,000,000
" "	1,000,000
" "	1,000,000
Chemnitz	1,000,000
Crewe	1,250,000
Colonial Gas Works Co	100,000
Cadiz	300,000
Charlottenburg	600,000
Dudley	750,000
Driffield	100,000
Dukenfield	500,000
Dover	750,000
"	1,000,000
Deal	200,000
Derby	1,500,000

	Capacity. Cubic feet per day.
Dublin	3,000,000
Dowlais	100,000
Douai	500,000
Denton	500,000
Derby, U.S.A.	350,000
Denver, "	500,000
" "	1,000,000
Dusselldorf	750,000
"	500,000
Dumfries	250,000
Dunedin, N.Z	400,000
Darlington	1,250,000
Detroit, U.S.A.	750,000
Edinburgh	1,500,000
"	2,000,000
Enfield	300,000
Essen	300,000
Elbing	150,000
Falmouth	150,000
Frankfort	300,000
Farnworth	400,000
Fenton	400,000
Friedenshutte	500,000
Furth	400,000
Freiburg	200,000
Goole	250,000
Glossop	300,000
Guildford	300,000
Gloucester	1,250,000
Gera	300,000
Grafton, N.S.W	100,000
Grieg	300,000
Georgetown, U.S.A.	250,000
Gluckauf	200,000
Heywood	600,000
Holywood	125,000
Huy	70,000
Harrow	250,000
Harrogate	250,000
Halstead	150,000
Heilbronn	200,000
Havana, Cuba	750,000
Hastings	1,500,000
Huddersfield	300,000
"	750,000
"	1,500,000
Hof	200,000
Hampton Wick	500,000
Heckmondwicke	500,000
Haverfordwest	100,000
Halifax, N.S.	350,000
Hamm	200,000
Halle	400,000
Heidelberg	300,000
Hartford, U.S.A.	1,000,000
Ilkeston	300,000
Inverness	250,000
Ilkley	200,000
Ilford	100,000
Kingston-on-Hull	400,000
Kidderminster	750,000
Kidsgrove	100,000
Konigberg	1,000,000
King's Lynn	300,000

LONDON:—

The Gaslight and Coke Co.:	
Beckton	1,250,000
"	1,250,000
"	1,250,000
"	1,250,000
"	1,250,000
"	1,250,000
"	2,500,000
"	2,500,000
Silvertown	1,000,000
Bromley	2,000,000
"	1,500,000
"	1,500,000
"	1,500,000
"	2,000,000
"	1,500,000

LONDON—*Continued.*	Capacity. Cubic feet per day.
Shoreditch	2,500,000
Pancras	1,500,000
"	1,500,000
Pimlico	2,000,000
Nine Elms	3,000,000
"	3,000,000
South Metropolitan Co:—	
Greenwich	3,000,000
Woolwich	400,000
Vauxhall	3,000,000
"	3,000,000
Lea Bridge	300,000
West Ham	1,500,000
Leeds	2,000,000
"	3,000,000
"	3,000,000
"	3,000,000
"	3,000,000
"	2,000,000
Leominster	150,000
Leiden	560,000
"	600,000
Liverpool	2,000,000
"	2,000,000
"	2,000,000
"	2,000,000
"	2,000,000
"	3,000,000
Lincoln	1,000,000
"	600,000
Lowell, U. S. A	1,000,000
Louisville "	1,500,000
Long Eaton	500,000
Lilie	900,000
"	450,000
"	750,000
"	250,000
"	250,000
Luckenwalde	330,000
Liegwitz	300,000
Lincoln, U. S. A	250,000
Lawrence "	500,000
Lynn "	300,000
Lyons	1,500,000
Maidstone	1,000,000
Marseilles	1,500,000
"	1,500,000
Mons	500,000
Malines	250,000
Melbourne	1,500,000
"	1,500,000
"	1,500,000
"	1,500,000
"	1,500,000
Manchester	2,500,000
Middleton	400,000
Manley, N. S. W.	100,000
Minneapolis, U. S. A	750,000
Magdeburg	300,000
Memphis, U. S. A	750,000
Nottingham	1,250,000
"	2,500,000
"	2,500,000
"	2,000,000
"	1,500,000
"	2,000,000
Newport, U.S.A.	430,000
Newmarket	150,000
Newark, U.S.A.	680,000
Northfleet	200,000
New York, U.S.A.	2,000,000
Nice	600,000
Newcastle, N. S. W.	200,000
Numea, "	100,000
Namur	250,000
Newark	350,000
Oldbury	500,000
Otley	200,000
Oswestry	250,000

	Capacity. Cubic feet per day.
Ober Schlesian	1,500,000
Otto & Co.'s Coke Works	1,500,000
Plymouth	2,000,000
Parramatta, N. S. W	100,000
Prescott	150,000
Providence, U.S.A.	750,000
"	750,000
Plauen	300,000
"	300,000
Portsmouth	2,500,000
"	2,500,000
Pittsburgh, U.S.A.	1,500,000
Portland, "	560,000
Pawtucket, "	500,000
Quebec	250,000
Radcliffe	750,000
Rouen	250,000
Ramsgate	1,000,000
Reigate	200,000
Richmond, U.S.A	250,000
Roxbury, "	500,000
Runcorn Soap Co.	20,000
Rockhampton, N. S. W	125,000
Richmond	1,500,000
Reading	2,000,000
Reichenbach	200,000
Salford	1,750,000
"	1,750,000
"	1,750,000
Smethwick	750,000
Sydney, N. S. W	1,000,000
"	1,000,000
"	2,500,000
"	50,000
"	50,000
Sunderland	1,500,000
St. Josephs, U.S A	250,000
Spa	100,000
Sevenoaks	300,000
St. Petersburg	2,000,000
"	1,500,000
St. Louis, U.S.A	2,000,000
"	2,000,000
"	1,000,000
Laclede	1,000,000
Silesian Coal Co.	600,000
San Francisco, U.S.A.	2,000,000
"	2,000,000
Sheepbridge Coal Co.	40,000
Stettin	200,000
Singapore	300,000
Sutton	500,000
Tonbridge	150,000
Tipton	400,000
Tottenham	1,000,000
Toledo, U.S.A	750,000
Toronto	1,000,000
Uxbridge	300 000
Valparaiso	500,000
West Bromwich	1,000,000
Willenhall	250,000
Weston-super-Mare	500,000
Waltham	150,000
Wormwood Scrubs	300,000
Williamsburg, U.S.A.	600,000
"	600,000
Wellington	150,000
Warwick	300,000
Wheeling, U.S.A	500,000
Walker	300,000
Westgate	100,000
Wilmington, U.S.A	500,000
Windsor, N. S. W.	100,000
Wolverton	100,000
Wellington, N. Z.	250,000
Whitchurch	175,000
Washington, U.S.A.	2,000,000
Wallasey	750,000
Weimar	150,000
Wurzen	200,000
Worcester, U.S.A	750,000
Yeadon	500,000
Yeovil	250,000

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Sioux Falls Gas Co.	Sioux Falls, Dak.
Dakota Gas and Fuel Co.	Grand Forks, Dak.
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Stillwater Gas Light Co.	Stillwater, Minn.
St. Paul Gas Light Co.	St. Paul, Minn.
Emporia Electric and Gas Light Co.	Emporia, Kas.
Van Wert Gas Light Co.	Van Wert, Ohio.
Lansing Gas Light Co.	Lansing, Mich.
San Francisco Gas Light Co.	San Francisco, Cal.
Shelbyville Gas Light Co.	Shelbyville, Ind.
Great Falls Gas Light Co.	Great Falls, N. H.
*Belleville Gas Co.	Belleville, Ontario.
*Rochester Light and Fuel Co.	Rochester, Minn.
*Northwestern Gas Light and Coke Co.	Evanston, Ill.
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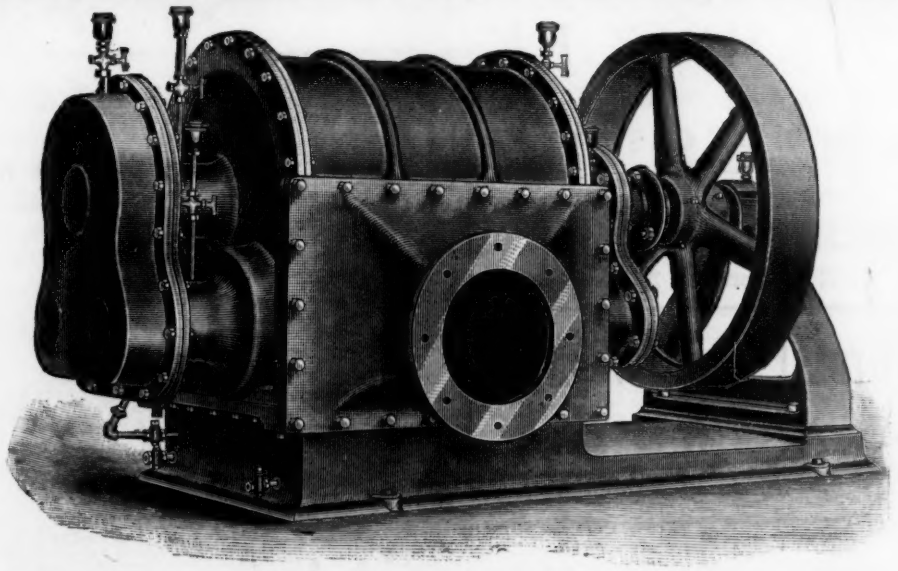

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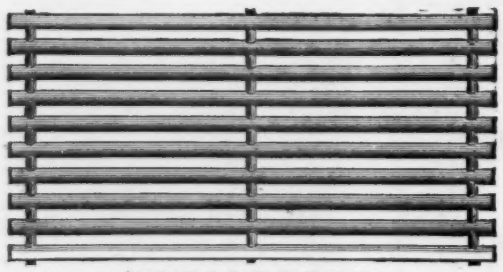

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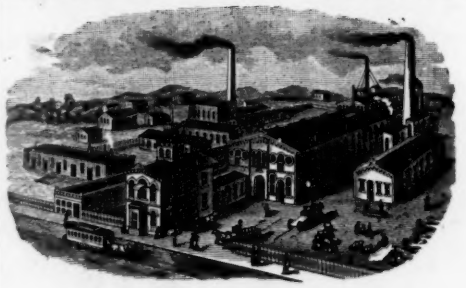

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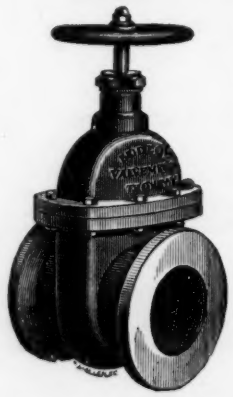

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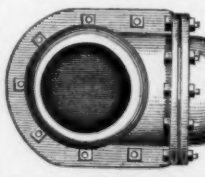

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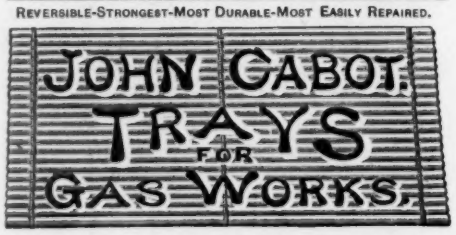

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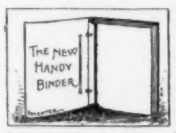

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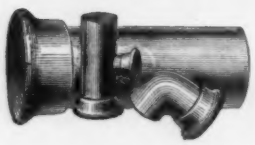

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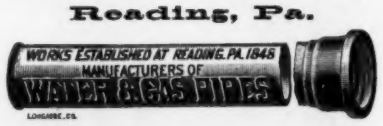

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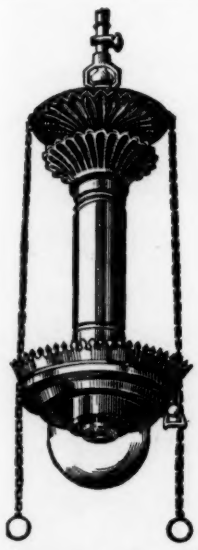

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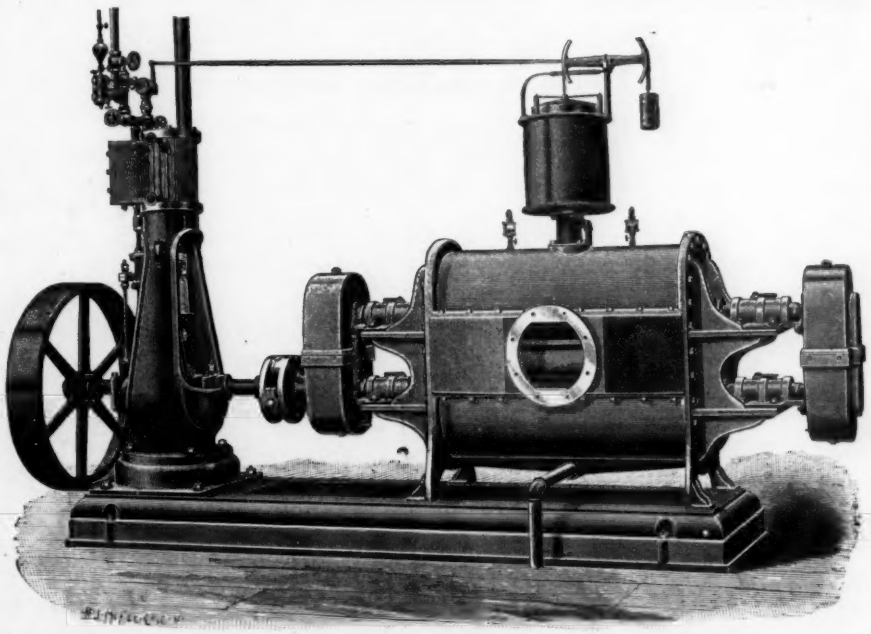

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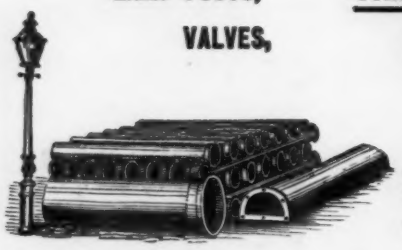

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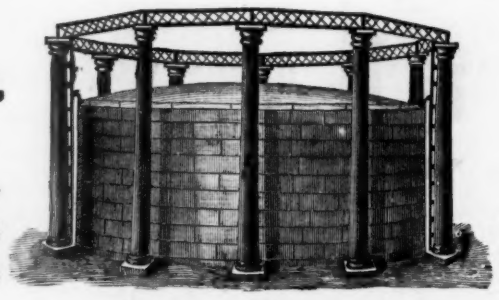

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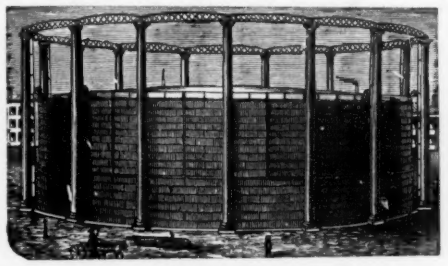

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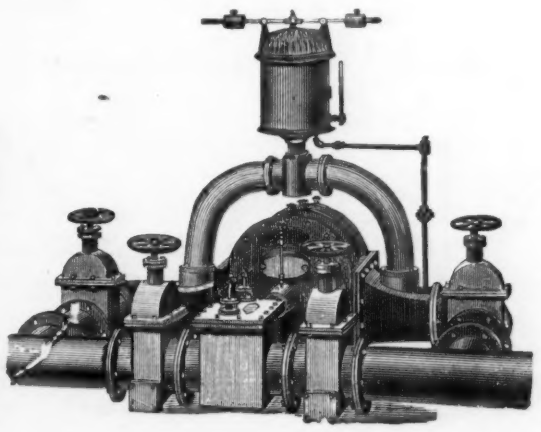

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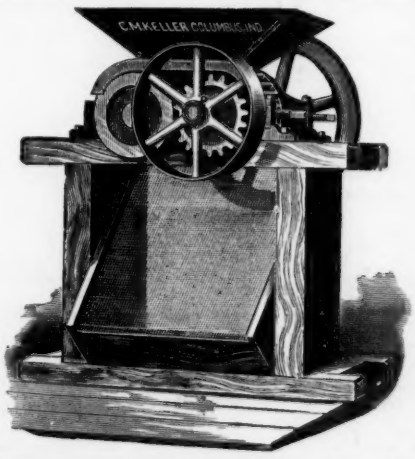

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50-H.P. STEAM ENGINE AND BOILER, Running a Plant of Fifty 2000-C.P. Arc Lamps 12 Hours.	
4,500 lbs. Indiana nut and slack, at $1.30 per ton	$2 93
Engineer, one night, at $50 per month	1 67
Trimmer, one day, at $40 per month	1 33
Superintendent or Electrician, one day, at $50 per month	1 66
Waste, etc., one day, at $20 per year	05
Water rent, one day, at $40 per year	11
Wheeling coal and removing ashes, at $4 per week	58
100 pairs carbons, at $18.50 per 1000	1 85
One pint cylinder oil, at 60 cents per gallon	07
One quart engine and dynamo oil, at 50 cents per gallon	13
Total	$10 38

50-H.P. OTTO GAS ENGINE, Running a Plant of Fifty 2000-C.P. Arc Lamps 12 Hours.	
9,200 cu. ft. gas, at 42 cts. per M. (for cost of gas see items below)	$3 86
Engineer not needed; engine is in care of Electrician or Supt.	....
Trimmer, one day, at $40 per month	1 33
Superintendent or electrician, one day, at $50 per month	1 66
Waste, etc., one day, at $20 per year	05
Water rent dispensed with (cooling water used over and over)	....
Handling of coal included in cost of gas	....
100 pairs carbons, at $18.50 per 1,000	1 85
One pint cylinder oil, at 60 cents per gallon	07
One quart engine and dynamo oil, at 50 cents per gallon	13
Total	$8 95

Expenses of depreciation, repairs, and interest omitted, being considered the same in both cases—though depreciation and repairs are much higher with steam on account of boiler and its appurtenances. Cost of gas in the holder we estimate for most of the Middle and Western States as follows: Coal, 30 cts.; labor, 20 cts.; purification, 2 cts.; total, 52 cts. Less coke, 7 cts., and tar, 3 cts.; leaving net cost of gas 42 cts. The items of Superintendence and repairs, being paid for by the gas sold to consumers, need not be charged on extra output for gas engine consumption. Where the cost of gas is higher than here figured, coal for steam use will be found proportionally higher, and final figures of comparison show same amount of saving.

Excess in Cost of Steam over Gas Power is thus $1.43, or nearly 16 per cent.

Coal for getting up steam and banking fires is not included in above figures, and should be added, thus increasing rate of economy of gas power beyond that shown by our figures.

Where Gas Companies adopt Gas Power for Electric Plants, Water Works, Sewerage, etc., they not only choose **the most economical power for their use,** but secure to themselves the **numerous advantages of increased production,** without increase of expense, and benefit thereby their entire manufacture. They induce consumers, by their example, to abandon Steam for Gas Power, and, by establishing special rates, make

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"Otto Gas Engine Works,"

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